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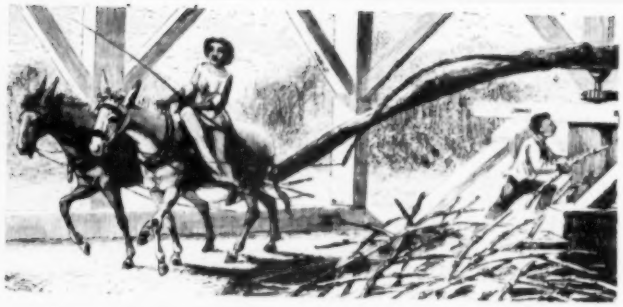
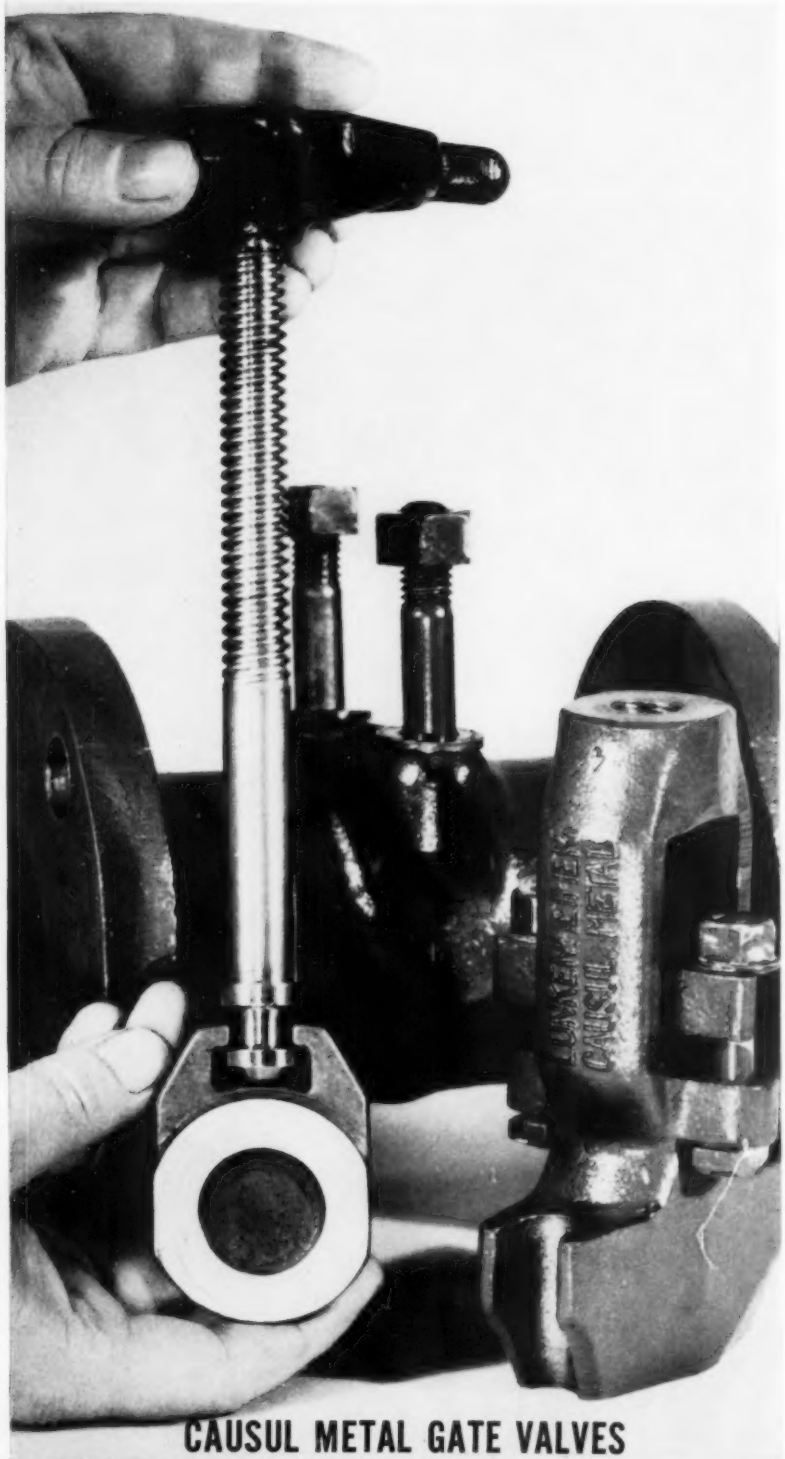


SUGAR Y AZUCAR

JUNE 1958

Kroger



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"HIGH ALLOY" Performance at Iron Valve Costs

CAUSUL METAL GATE VALVES *by* LUNKENHEIMER

"Causul" Metal Valves offer *balanced* corrosion-resistance, yet cost far less than expensive high alloy valves. "Causul" Metal bodies and bonnets are teamed with Stainless Steel or Monel seats, discs, and stems to give maximum resistance to corrosion at the lowest possible cost. Heavy, thick body walls provide extra strength and durability. For full details on the maintenance-saving features of "Causul" Metal Valves, call the Lunkenheimer Distributor in your area. He will be glad to show you how you can keep valve maintenance costs down without investing in premium priced high alloy valves. . . . Or write The Lunkenheimer Co., Cincinnati 14, Ohio.

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LUNKENHEIMER QUALITY

LUNKENHEIMER®

THE ONE *Great* NAME IN VALVES

Factory	Country	Diameter
64. Taiwan Sugar Corp.	Formosa	20
65. Taiwan Sugar Corp.	Formosa	22
66. Taiwan Sugar Corp.	Formosa	22
67. Taiwan Sugar Corp.	Formosa	28
68. Cunagua	Cuba	36
69. Jaronu	Cuba	28
70. Cuba	Cuba	24
71. Violeta	Cuba	30
72. Catarey	Dominican Republic	28
73. Romana	Dominican Republic	30
74. Consuelo	Dominican Republic	32
75. Boca Chica	Dominican Republic	20
76. Montelimar	Nicaragua	18
77. Casa Grande	Peru	32
78. Pucala	Peru	22
79. San Jacinto	Peru	20
80. Ormoc	Philippines	19
81. Plata	Puerto Rico	22
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84. Sugauli	India	18
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86. Godavari	India	22
87. Mysore	India	20
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89. Belsund	India	20
90. New India	India	22
91. Oudh	India	28
92. Brihan	India	22
93. Maduranthakham	India	18
94. Madras I	India	16
95. Madras II	India	16
96. Zeyawadi	Burma	20
97. Zeyawadi	Burma	20
98. Savanna	Reunion	22
99. Fairymead	Australia	22
100. Rio Grande	Argentina	22
101. Concepcion	Argentina	26
102. Ledesma	Argentina	20
103. Ledesma	Argentina	30
104. Matari	Brazil	14
105. Serro Azul	Brazil	14
106. Sao Martinho	Brazil	30

106 UNITS to date

World-Wide Acceptance* of New RapiDorr Clarifier

***43 New Units Sold in 1957**

...is Your Guarantee of Superior Performance

Since its development 5 years ago, 106 RapiDorr Clarifiers — 43 in 1957 — have been ordered by sugar manufacturers in 27 countries throughout the world for both new installations and for conversion of existing stations. For more information on the RapiDorr write for a copy of Bulletin No. 4092, which is also printed in Spanish No. 4092-S.

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Sugar y Azucar for June, 1958. Volume 53, No. 6. Published monthly by Russell Palmer Trust, Mona Palmer, Publisher. Publication Office, 109 Market Pl., Baltimore, Md. Editorial and executive office, 604 Fifth Avenue, New York 20, N. Y. Accepted as controlled circulation publication at Baltimore, Md.

SUGAR y AZUCAR

Volume 53, No. 6 June, 1958

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COVER *No matter how rapidly the technology of sugar production advances, the industry will always cast a nostalgic look backward at its romantic origins, perhaps encouraged by the fabulous prices obtained for a pound of sugar when sugar was produced as illustrated on the front cover of this month's issue. Here Charles Kroger has enclosed early scenes of the industry, provided by Bettmann Archive, in frames appropriate to other years.*

CUBIERTA *Indistintamente del rápido avance en la técnica seguida en la producción de azúcar, la industria siempre recordará con cierta nostalgia su romántico origen, alentada tal vez por los precios fabulosos obtenidos por el azúcar cuando se producía como se ilustra en la cubierta de la edición de este mes. En ella, Charles Kroger encierra viejas escenas de la industria, proporcionadas por The Bettmann Archive, en cuadros propios de años anteriores.*

Publisher, MONA PALMER
Editor, E. W. MAYO, JR.
Assistant Editor, JULIA McGRAW
Editor, Spanish Section, JOSE M. PENA
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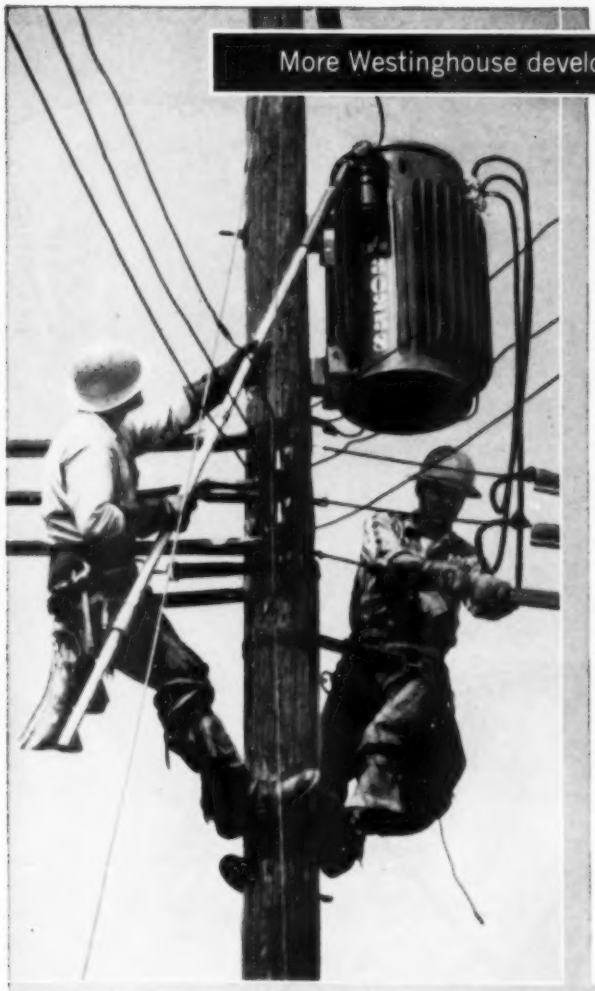
More Westinghouse developments for the sugar industry



CSP transformers cost less, install faster, last longer

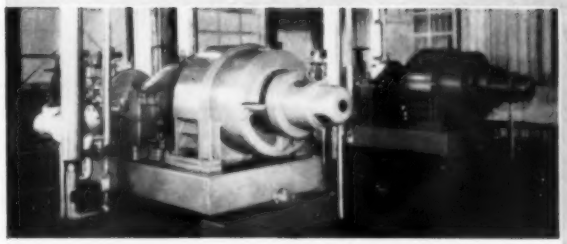
Here's why:

COST LESS: You save money on Westinghouse CSP distribution transformers because they're smaller and lighter than other units, rating for rating. Self-protected against lightning or line surges, they virtually eliminate burnouts and load surveys. In many cases, moreover, a smaller transformer will do a given job.

INSTALL FASTER: CSP transformers are easier to handle and install because of their lighter weight and smaller dimensions. This reduces both time and labor required for mounting.

LAST LONGER: A new "life-test" method developed by Westinghouse results in 20% higher overload capacity and 15% higher emergency control range—with no sacrifice in service life. Contributing to this extra performance are features like new Insuldur insulation and Hypersil core material which provide more capacity per pound of transformer. Ask for "Booklet 80-G".

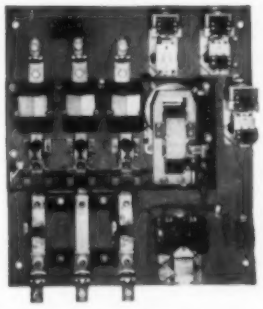
For more information on the development shown here, or help on specific engineering problems, write to Westinghouse Electric International Company, Box 345, Wall Street Station, New York 5, U.S.A.



More power per pound of fuel

No matter what fuel you use, you'll extract more power from it with a Westinghouse small turbine-generator. Available in ratings as low as 10-kv, these super-efficient generators can help reduce your power costs while providing a more dependable source of electricity. Write for "Booklet 80-H".

Exclusive De-ion® arc-quenching prolongs contact life



Two of the many reasons why the sugar industry looks to Westinghouse Life-Linestarters for fast, positive control action are: (1) Exclusive De-ion arc-quenching instantly extinguishes arc to reduce burning and pitting of contacts; (2) New "Add-a-Part" panel permits control changes with less time and labor. Ask for "Booklet 80-I".

YOU CAN BE SURE...IF IT'S Westinghouse

TIME'S TEST
proves
SUCHAR BEST

Central Mercedita, the largest cane sugar refinery in Puerto Rico, and one of the largest refineries in the world using activated carbon, is a complete SUCHAR refinery – it was outfitted with SUCHAR equipment when erected more than twenty-five years ago and has used SUCHAR activated carbon throughout this whole time. Central Mercedita *still* uses SUCHAR refinery equipment and SUCHAR activated carbon.

This refinery produces sugar under the trade name of Snow White and is also the home of the world-renown, quality Don Q and Boca Chica rums. As a producer of such quality products, Central Mercedita has learned in these twenty-five years that in economy and in efficiency time-tested-and-proved SUCHAR refining equipment and SUCHAR activated carbon make the world's best working combination in the sugar purification process.

With over thirty-five years of sugar processing "know-how", SUCHAR is staffed to solve *your* refining problems – whatever they may be. We invite your inquiries.

Your test will, too.

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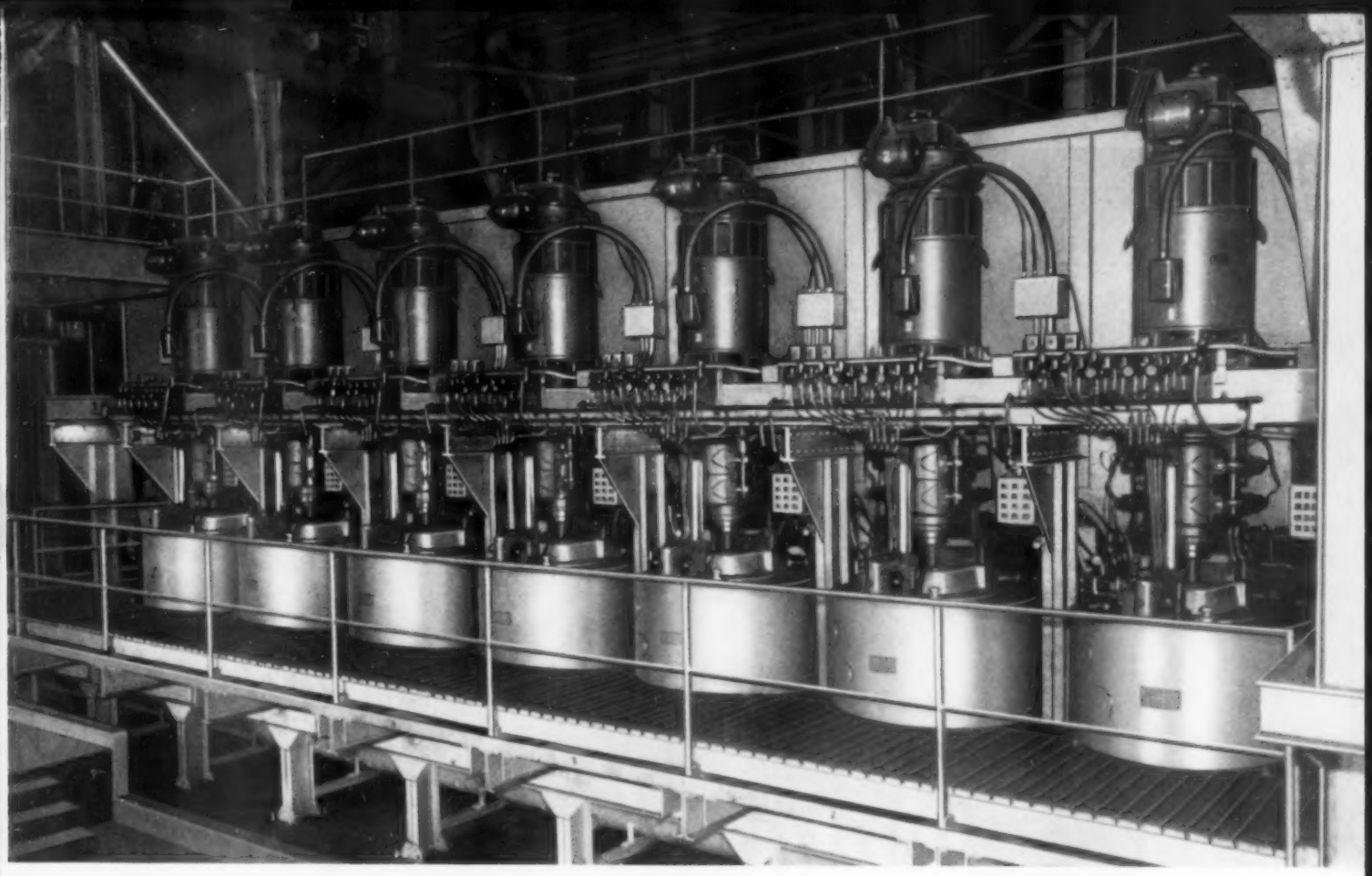
EXCLUSIVE SALES REPRESENTATIVES OF SUCHAR ACTIVATED CARBON FOR THE CANE SUGAR INDUSTRY.



2522

Photo of seven 48" x 30" G-8's used for A & B massecuites at Central Mercedita.

Central Mercedita

The First Completely Automatic Centrifugal Battery in Puerto Rico

FEWER MACHINES

Twelve machines replaced, yet capacity increased.

BETTER WORK

All sugar washed to high purity for direct refining without affination.

COMPLETELY AUTOMATIC

Automatic loading, plowing, and recycling. One attendant — no operators.

That's what Central Mercedita accomplished when the new Western States G-8 Centrifugals were installed.

Another page in our book of experience —

ROBERTS STEVENS

The WESTERN STATES MACHINE COMPANY
HAMILTON, OHIO, U.S.A.

— This experience is available to you.

"12,800 carloads of flour shipped in AIRSLIDE® cars without a damage claim!"

says J. A. Hart, Vice President, Traffic—National Biscuit Company

If you have a shipping problem with dry, granular or powdered materials, consult our engineers. You too will find . . . it pays to plan with General American.

National Biscuit Company pioneered bulk shipment of flour. As of December 31, 1957, NABISCO has transported more than 12,800 carloads from mills to bakeries.

Says J. A. Hart, Vice President, Traffic: "After several trial trips in 1948 and 1949 we were convinced that flour could be transported safely in bulk.

"Formerly, torn bags due to rough handling, leaky roofs and sides of ordinary boxcars, and weevil infestation resulted in loss and damage claims against carriers. *Shipping in AIRSLIDE® cars has eliminated the filing of loss and damage claims.*

"We also have shipped well over 300 carloads of sugar in AIRSLIDE® cars from various refineries to our Chicago bakery and not one claim has been filed with any railroad."

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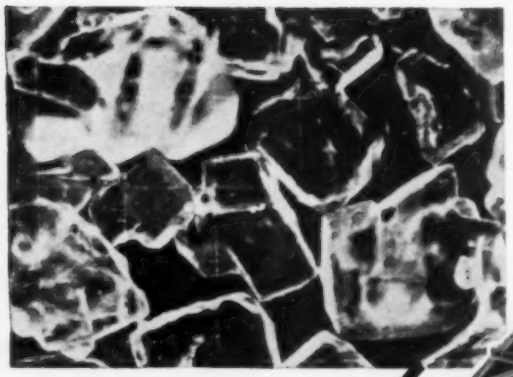

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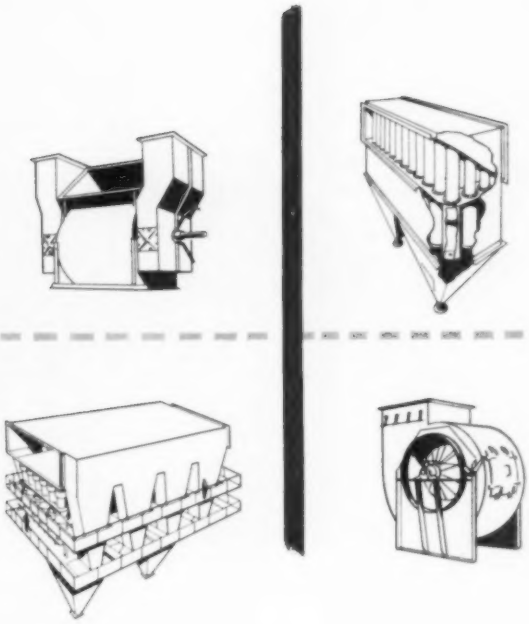

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If you are concerned with nuisance elimination . . . or with the recovery of cinder waste as a low cost fuel . . . WHIRLEX can help you. Our research laboratory, engineering and manufacturing facilities are totally set up and especially experienced to provide "dollar-saving" solutions to the most perplexing cinder collecting problems.

CENTRAL AGUIRRE, PUERTO RICO,

will fit their new 125,000 Pound Steam Generator with a complete WHIRLEX system of fans, collectors and re-injection equipment. Records of successful low cost operation for several seasons, with WHIRLEX equipment *on four other boiler units*, furnished the reasons for Central Aguirre's choice. The new boiler and its WHIRLEX equipment is scheduled to be placed in operation for the 1958 grinding season.

For completely integrated and co-ordinated dust control systems, the following shop-assembled equipment is available:

WHIRLEX Type CTF Mechanical Gas Centrifuge Collectors
WHIRLEX Type MTSA 9CYT Multiple Cyclone Collectors
WHIRLEX Induced Draft Fans • WHIRLEX Forced Draft Fans
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Special Duct Work • Self-Supporting Stacks • Dampers • Support Structures

WRITE TODAY for complete engineering data...

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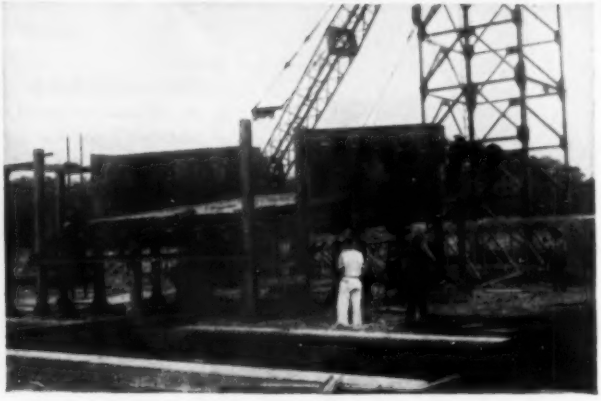
Even Feed...

. . . This first essential for good extraction is readily secured by the Mirrlees Feeding Table with levelling kickers.

The illustration shows an installation at a South American factory built and equipped by Mirrlees; the lower photograph was taken during construction. The Unloading Crane was also supplied by Mirrlees.



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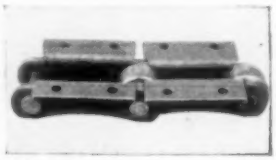
London Office : 38 Grosvenor Gdns., S.W.1

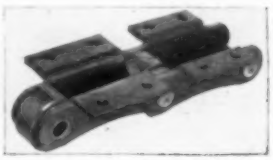
Durable Link-Belt SS chains bring low-cost efficiency to cane carriers

SS-600-K2 CHAIN is the strongest cane carrier chain for its weight. Has 6-in. pitch—average ultimate strength of 100,000 lbs. Selected steel sidebars are accurately machined for correct pitch and hole size. Rollers are machined for free-rolling and case-hardened for long life.

SS-96-K2 CHAIN — 6-in. pitch — has 47,000-lb. average ultimate strength, tight-fitting steel pins and bushings, case-hardened rollers.



SS-996-K2 CHAIN — 6-in. pitch — has average ultimate strength of 70,000 lbs., alloy steel heat-treated pins, case-hardened rollers and bushings.



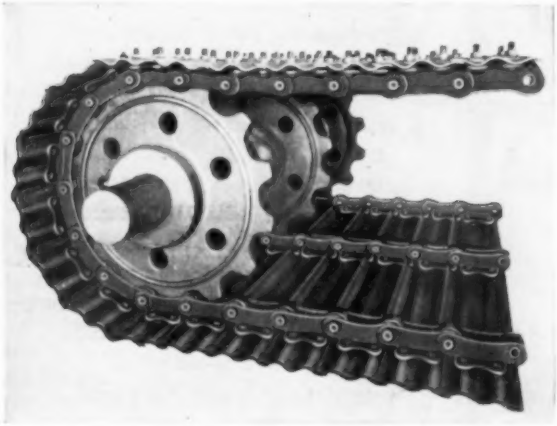
SS-800-K22 CHAIN — 8-in. pitch — has 125,000-lb. average ultimate strength, "full-round" alloy steel heat-treated pins, case-hardened bushings and rollers.

Complete line offers choice for specific capacity requirements

For low cost and long, trouble-free operation, choose the right chain for your cane carriers from the complete Link-Belt line. Properly proportioned for maximum average ultimate strengths ranging from 47,000 to 125,000 lbs., Link-Belt Class SS chains assure significant cost savings for all carrier capacities.

Manufacture and assembly of Link-Belt Class SS chains are closely controlled to provide extra wear resistance for severe cane carrier service. For example, rollers are accurately machined to assure free-rolling action, and are properly case-hardened for longer life. In addition, pins and bushings are carefully sized for proper press fit in accurately machined holes of sidebars. Bushings provide a smooth bearing surface for rollers and pins.

Alloy steel pins are heat-treated and are cadmium plated to inhibit corrosion. Pins are available drilled for pressure lubrication which results in longer chain life under this severe service.

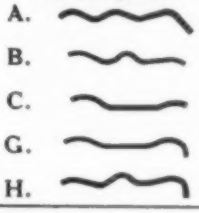


Sprockets and slats available for new installations and replacements

Link-Belt's complete line of cast and cut tooth sprockets permits correct matching with every type and size of chain. Split or solid arm or center plate wheels are available in gray iron for relatively light, clean service . . . cast steel for severe shock and high torque applications . . . Flint-Rim for heavy loads and extremely abrasive operating conditions. Accurately cast and ground teeth assure proper chain contact.

Link-Belt also offers cane carrier slats in a broad range of types, metals and sizes—bolted or riveted designs—for new installations or replacements. All are designed to assure rigidity and minimum leakage of knifed cane.

Choice of 5 Slat Styles



For facts, call your Link-Belt representative or write direct.

Link-Belt chains for sugar service—

HERE ARE JUST A FEW:

Class C combination malleable and steel chains for feeding tables . . . *Class SS and LXS steel roller chains* for main cane carriers, bagasse carriers and for heavy-duty drive service . . . *Class 1100 malleable and Promal chains* for short center and light load bagasse conveyors . . . *Class 900 malleable, Promal, bronze and stainless steel chains* for intermediate cane carriers . . . *Class 400 pintle malleable or Promal chains* for juice strainers. Let Link-Belt help select the right chain for your needs.

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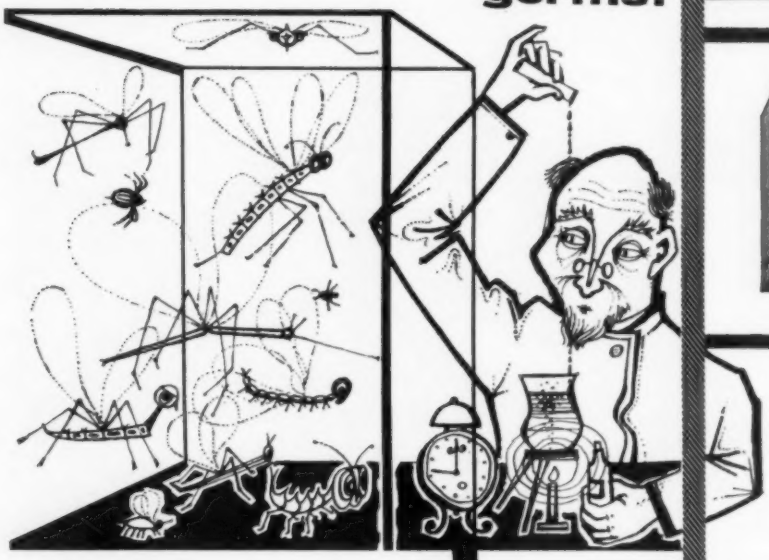
CHAINS AND SPROCKETS

14,635

LINK-BELT COMPANY: Engineers • Manufacturers • Exporters of Machinery for Handling Materials and Transmitting Power • Established 1875. **EXPORT DIVISION:** 2680 Woolworth Bldg., New York 7, U.S.A. Cable Address: Linkbelt—New York • Representatives Throughout the World.

Louis Pasteur

had to work fasteur to avoid coming to terms with any of his germs!



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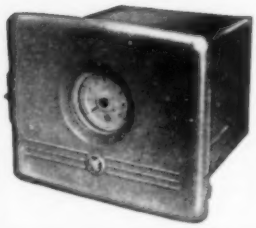
Cat. No. 11530

For stable measurement and control of process solution acidity and alkalinity.



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Designed to give a direct indication of the purity of distilled and deionised waters, this small Conductivity Meter is capable of driving recorders and controllers. The standard range is 0.1–100 micromhos.

AUTOMATIC TITRATOR

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For quick and accurate routine titrations: designed to combine with a variety of pH, millivolt and conductivity measuring instruments. Can operate a wide range of reagent adding devices and give accurate control of dosing.

Pasteur was one of the greatest discoverers in medical history—and his work has benefited millions of men, women and children. His work is carried on by scientists all over the world who are working, sometimes at great risk to themselves, to improve the lot of man physically and towards improving his environment. Many of these men use Pye Scientific Instruments, because of the precision and reliability which are assured by the designers and craftsmen in the W. G. Pye factory at Cambridge.

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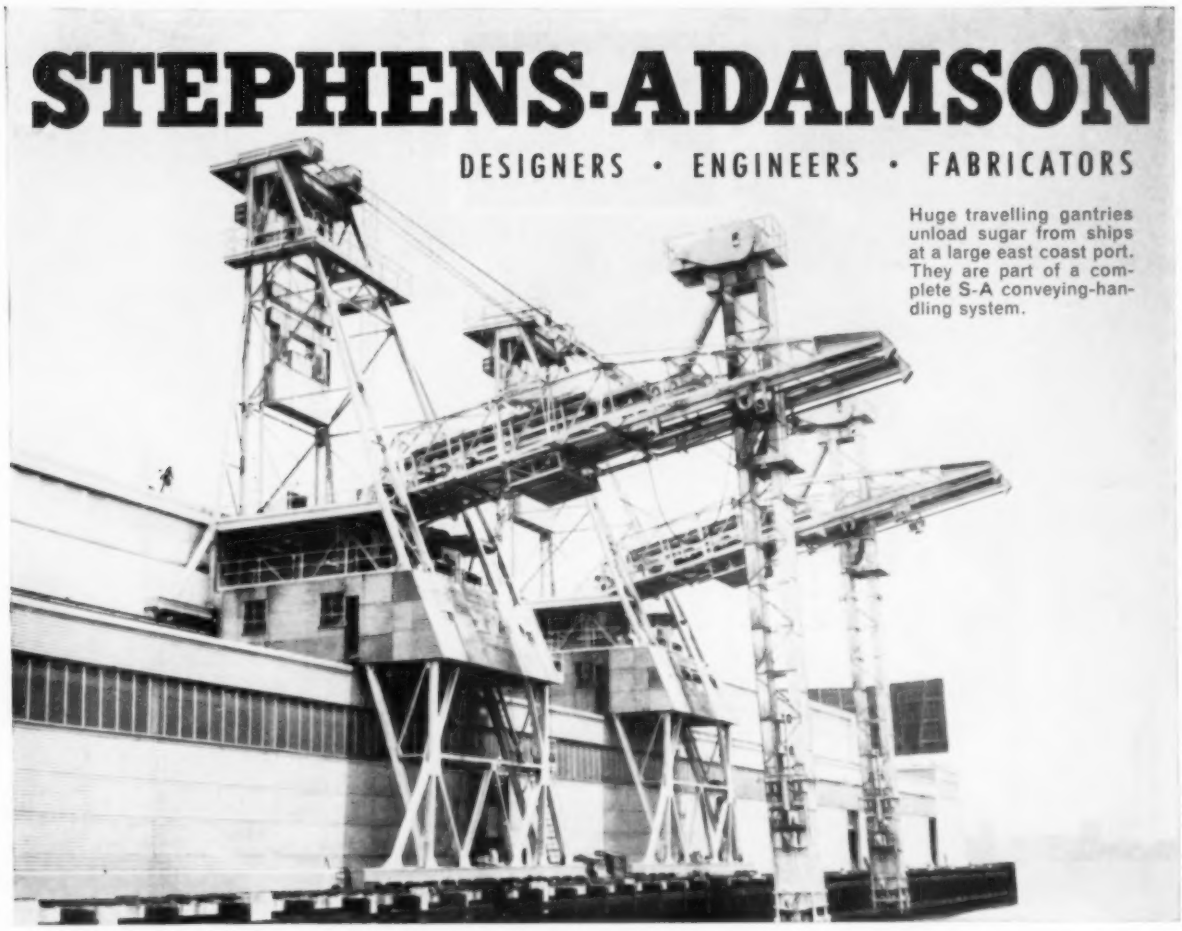


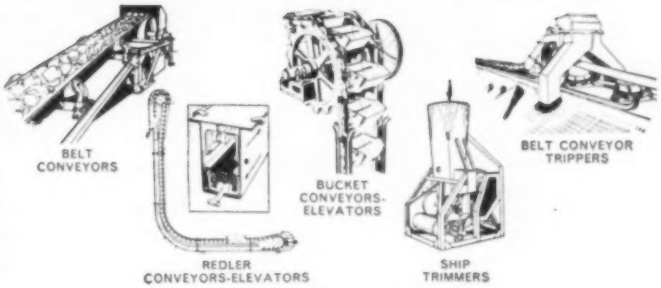
Huge travelling gantries unload sugar from ships at a large east coast port. They are part of a complete S-A conveying-handling system.

Conveyor Systems—by the men who know conveying best!

Nowhere does greater need exist for modernization and mechanization of bulk conveying methods than in the sugar industry. Never will operational costs be more urgent in demanding the most efficient and economical methods of bulk sugar conveying.

Competitive pressure during the next ten years can well decide who will survive in the industry. Anticipating the future, many of the world's sugar processors are solving their conveying problems with the help of S-A engineers—men who know sugar conveying best.

A lot rides on the right analysis of the bulk sugar handling requirements in your plant. The right man for this analysis is an experienced man. He is the STEPHENS-ADAMSON sales engineer in your area.



MODERNIZE FOR PROFIT

In the wide range of manufactured products built by S-A, many have direct application in handling bulk sugar. Shown here are a few of the conveyor tools which the engineer incorporates into his plan when designing a specific system. These products represent more than half a century of development and experimentation. They are designed to require minimum man power and to provide longest possible service with the least maintenance or down time.

S-A manufactures a wide range of material handling products in three complete plants in U. S. and Canada.

- Belt Conveyors
- Belt, Pan & Plate Feeders
- Ship Loading Boom Conveyors
- Stacking Conveyors
- Storage & Reclaiming Systems
- "Natural Frequency" Vibrating Conveyors
- REDLER Conveyor-Elevators
- ZIPPER Conveyor-Elevators
- Conveyor Belt Cleaners
- Headshaft Holdbacks
- Grizzlies & Screens
- Centrifugal Pilers
- Bin Gates & Tunnel Gates
- Car Pullers & Spotters
- Bucket Elevators
- Skip Hoists
- SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above products.*

SINCE 1901 S-A STEPHENS-ADAMSON MFG. CO.

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MAIN OFFICE & PLANT

56 RIDGEWAY AVENUE
AURORA • ILLINOIS

PLANTS LOCATED IN: LOS ANGELES, CALIF. • CLARKSDALE, MISS. • BELLEVILLE, ONTARIO

FOUR 48" THREE SPEED AUTOMATIC PLOUGHING CENTRIFUGALS

IN AUSTRALIA . . .

. . . the BABINDA factory near Cairns installed five centrifugals identical to those shown in the illustration for the 1957 crushing season to cure all 'A' and 'B' massecuites. Seventeen more of these machines are being installed during 1958 in factories in the Mackay and Bundaberg areas.

The centrifugals are fully automatic except for charging, "Poppleton" baskets are 48" x 24" x 7", motors are wound to give speeds of 375/750/1000 R.P.M. synchronous, automatic ploughs are housed above the monitor casing top and semi automatic top covers are fitted. The machines never come to rest during normal operation.

Six 42" x 1500 R.P.M. centrifugals are being installed in Queensland this year to cure 'C' massecuites.

THOMAS BROADBENT & SONS LTD HUDDERSFIELD ENGLAND

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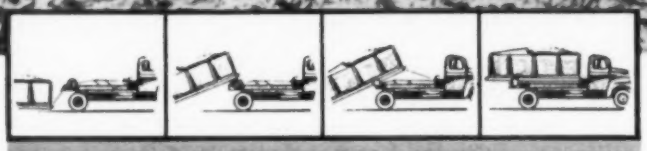

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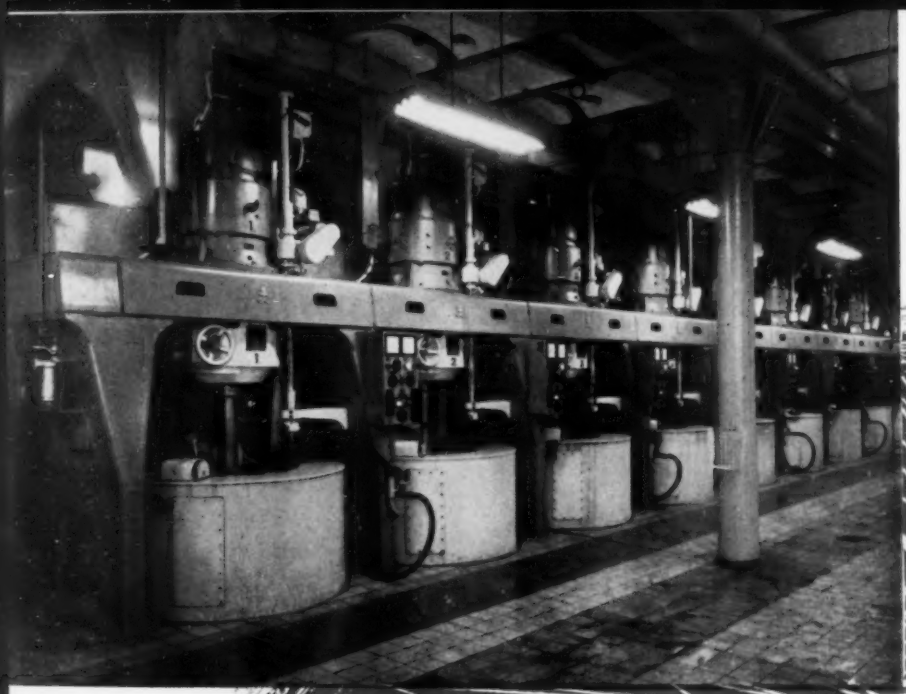

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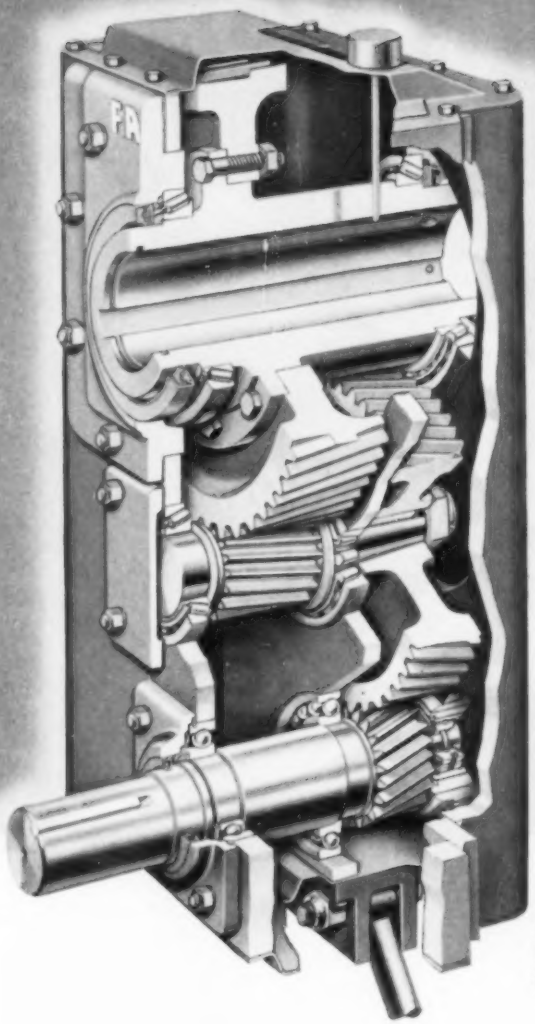

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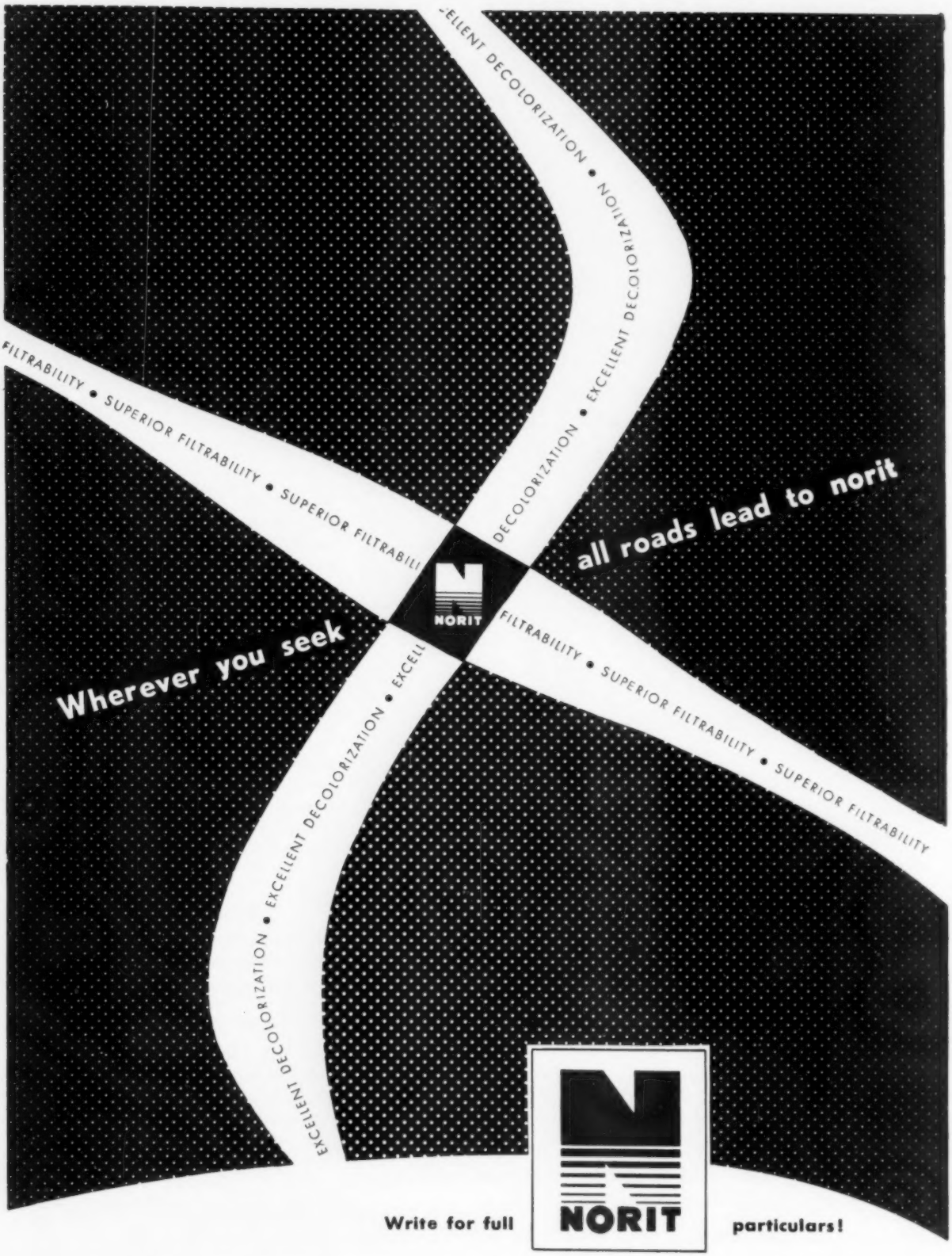

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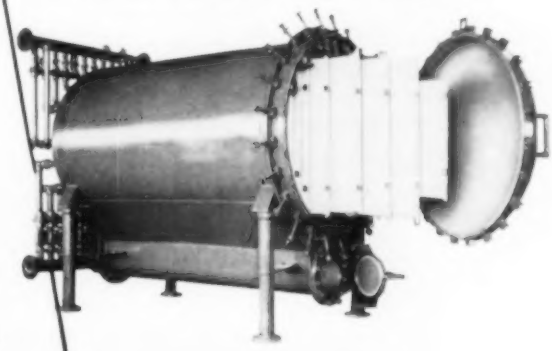

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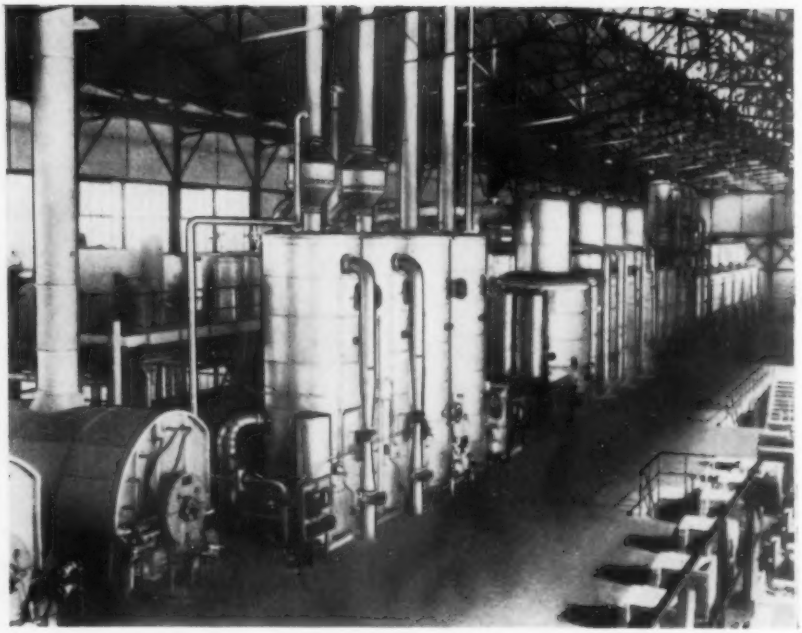

Inside view of the Malatya Sugar Mill (Turkey)

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BEET

	T day
France	
Artenay	1200
Cagny	800
Corbeilles-du-Gatinais	1200
Origny-Ste-Benoite	900
St-Leu-d'Esserent	1000
Algeria	
Mercier-Lacombe	300
Turkey	
Kayseri	1800
Malatya	1200

CANE

	T/day
Bolivia	
Guabira	1000
Brazil	
Jacarezinho	600
Matosinhos	800
Vassununga	1000
Uruguay	
El Espinillar	1200
Venezuela	
Ureña	700
Madagascar	
Ankaratra	2500
French Congo	
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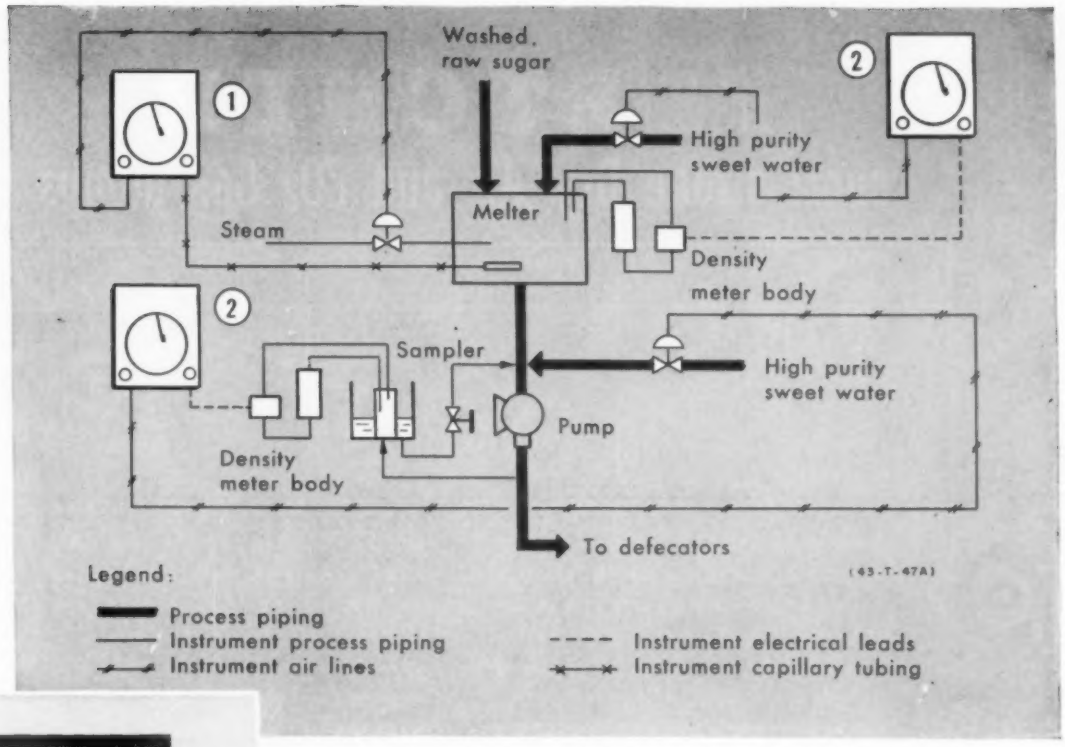

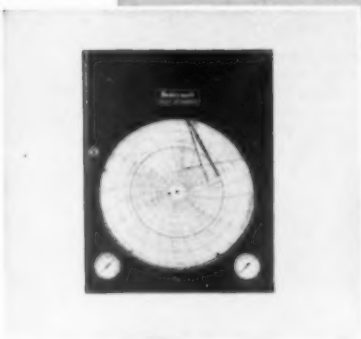

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18"	10"	880	300
24"	12"	1,570	250
30"	15"	2,460	200
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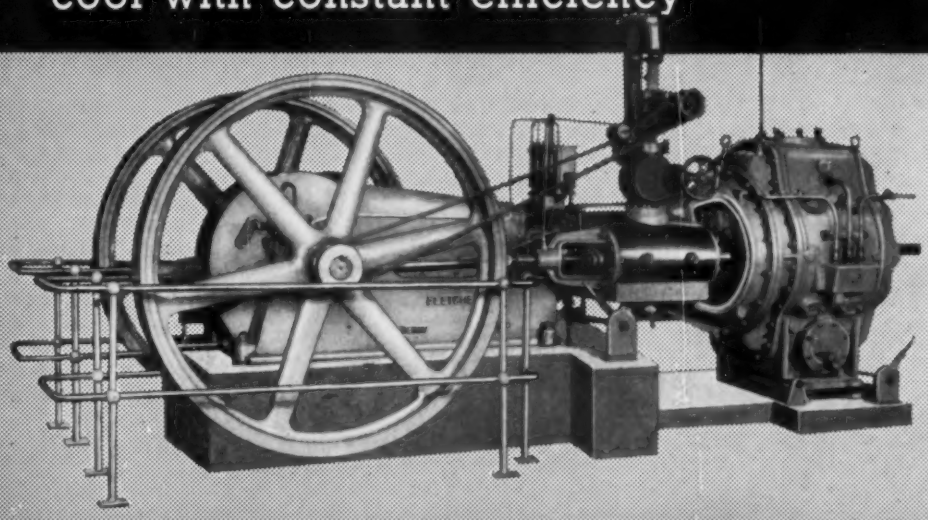

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SUGAR

JUNE, 1958

New Bactericide Inactivates Invertase

By Dr. John W. Appling

Chief Research Microbiologist, Food Section, Buckman Laboratories

A new and more complete approach for reducing sucrose losses has been developed. This approach is based on the use of a new bactericide consisting of organic sulfur compounds which is added at the first two or three mills in each tandem. It controls slime throughout all parts of the sugar mill equipment which are contacted by the treated juice from the time it is extracted until it reaches the clarifiers. Since some of the microorganisms in the slime constitute the major source of invertase, good slime control virtually eliminates this source of the sucrose-destroying enzyme. Furthermore, the bactericide itself inactivates invertase. Neither bagasse nor other organic matter in the juice affect the activity of the bactericide, and neither the sugar, nor the first molasses made from juice containing 10, 20, and 40 p.p.m. of the bactericide, contain any detectable quantity of it.

NORMAL cane juice appears to be almost an ideal medium for the growth of a wide variety of microorganisms. It contains approximately 14% of sucrose, adequate amounts of nitrogenous compounds and a number of growth factors. It has a favorable pH and temperature when it is freshly expressed from the cane. Under the conditions prevailing in most sugar mills, the growth of some microorganisms starts almost immediately after the juice is expressed. One effect of this growth is to reduce the amount of sucrose in the juice. With regard to sucrose losses, Owen (2) states that under ordinary conditions, it is generally assumed that in the time that intervenes between the extraction of the juice from the cane and its transfer to the clarifiers, no perceptible loss in sucrose occurs; however, there is strong evidence that this does not apply to milling operations where the mill is not maintained in a sanitary condition. For example, Orth observed that under unfavorable conditions, resulting from the operation of dirty mills, the loss of sucrose was quite rapid. On the other hand, when cleanliness was maintained, the juice from the last mill could be kept for five hours with little evidence of deterioration taking place.

It is known that certain species of bacteria secrete the enzyme invertase, and that very small concentrations of this enzyme rapidly invert sucrose into glucose and fructose. In addition to the invertase secreted by the microorganisms, there may be significant amounts of invertase in the cane juice as it is expressed from the cane. The slime that accumulates on the mill equipment which is in continuous contact with the juice constitutes the most important source of invertase. Frequent and thorough cleaning of slime from milling equipment helps to reduce the losses of sucrose. However, the rapid growth of microorganisms in the highly nutritious juice makes it impractical to eliminate the slime accretions and the consequent loss in sucrose due to inversion by the enzyme.

One approach for reducing sucrose losses in freshly extracted cane juice is to add continuously either chlorine or compounds which release chlorine, such as hypochlorites and chloramine. Since chlorine reacts quickly with all types of organic matter in the juice and with the bagasse itself, such treatments are necessarily limited to short periods of contact between the juice and the chlorine. In addition to the corrosive action of chlorine gas and chlorine from hypochlorites, there is a lack of adequate control of the slime accretions on the surfaces which are not contacted by the chlorine. As pointed out previously, slime accretion on equipment constitutes the most important source of invertase and, unless such accretion is eliminated, it will continue to produce invertase in those parts of the mill system not treated with the chlorine or chlorine-releasing compounds. While there is no doubt that invertase is the direct cause of the inversion, the most effective manner of preventing this inversion should be to eliminate the most important source of invertase, namely, the microorganisms in the slime accretions on the equipment.

If, in addition to preventing slime accretion on the mill equipment, the treatment would also inactivate all or most of the invertase still remaining in the juice, this would indeed be a new and more complete approach for reducing sucrose losses in cane juice. The writer will now present the experimental evidence which indicates that such an effective treatment is possible.

This experiment consisted in observing the effect of adding continuously a new organic sulfur bactericide A[1] for one week to the juices fed to the crushed cane leaving mills No. 1 and No. 2 on one tandem in this mill. The amount of bactericide added was 10 p.p.m. parts of dilute juice leaving this tandem. Before the experiment had started, it was noted that the juice distribution plate above Mill No. 1 was covered with an appreciable thickness of brownish slime and that the corresponding plate above Mill No. 2 was similarly covered with a much smaller amount of this slime. On the morning of the first day of the experiment, approximately one-half of the distribution plate above Mill No. 1 was cleaned mechanically to remove all visible slime and the rest of the plate was left covered with slime. Observations were made during a 10-day period for slime accretion on this distribution plate. The mechanically cleaned part of the plate showed no accretion until the third day after the treatment had been discontinued. The slime-covered portion of this plate gradually became as clean as the other portion within two days, and remained clean until the third day after the treatment had been discontinued. At this time a small but observable slime accretion was present. This indicated that there had been a residual effect from the bactericidal treatment which lasted nearly three days after the treatment had been discontinued.

Based on more than 10 years of success-

---

[1] **Bactericide A has the following composition:**

Active ingredients	
Disodium cyanodithioimidocarbonate	**20 %**
Ethylenediamine	**7.5%**
Inert ingredients	**72.5%**

ful slime control in paper mill systems in the United States and Canada, the writer is confident that continued absence of slime accretion from previously slime-covered portions of mill equipment means good slime control by the bactericide employed. Therefore, applying this same criterion to the observations made in this sugar mill, the writer believes that slime control was achieved at least in the two mills treated with bactericide A and probably wherever this treated juice contacted the mill equipment enroute to the clarifiers. Absence of visible slime signifies the absence of myriads of microorganisms which produce this slime, including those species which secrete invertase. No attempt was made in this relatively short experiment to determine the amount of reduction in sucrose losses. However, a reduction in the loss of sucrose would be an inevitable result regardless of whether this could have been established statistically in the face of the many variables involved in sugar mill operation.

The writer has done a number of laboratory experiments to measure the effect of invertase alone and invertase with small amounts of organic sulfur bactericides upon the inversion of pure sucrose and refined cane sugar. Decreasing amounts of purified invertase were employed until the amount of invertase had caused about 1.9% loss in sucrose within 30 minutes and about 9.0% loss within 60 minutes. In this particular experiment, four equal portions of 0.4 normal sucrose solutions contained respectively no bactericide, 10 p.p.m. of bactericide A, five parts per million of bactericide B[2], and 10 p.p.m. of bactericide B. Each portion contained one mg. of purified invertase in 100 ml. of the sucrose solution. Polarimeter readings were taken after 15, 30 and 60 minutes at approximately 27° C. The experiment was repeated once. Sucrose contents were determined by the Herzfield-Schrefeld Modification of Clerget's Method (3). The losses of sucrose in percent are given in Table 1.

These data show that 10 p.p.m. of either bactericide A or bactericide B resulted in essentially complete inactivation of invertase for at least 30 minutes. It is of interest to note that even five parts per million of bactericide B caused significant reductions in sucrose loss during the initial period of 30 minutes.

Bactericide B has already demonstrated superiority over bactericide A in the control of microorganisms in paper mill systems and elsewhere. We believe, therefore, that this paper mill experience together with the ability of bactericide B to inactivate invertase indicate a new and more complete approach for the reduction of sucrose losses in cane juice. Not only do we have a bactericide which prevents slime accretion and thereby greatly diminishes the production of invertase by the microorganisms which were in the slime, but we also have a bactericide which inactivates invertase for adequate periods of time from the standpoint of sugar mill practice.

[2] **Bactericide B has the following composition:**

Active ingredients	
Disodium cyanodithioimidocarbonate	**13.3%**
Ethylenediamine	**4.7%**
Potassium N-methyldithiocarbamate	**18.0%**
Inert ingredients	**64.0%**

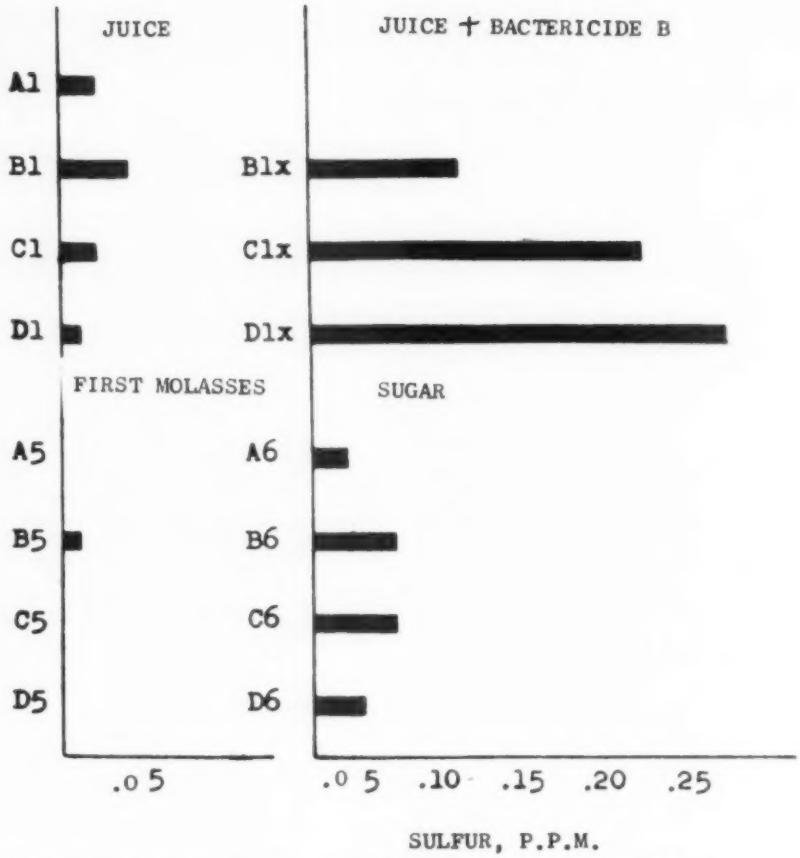

Fig. 1. Content of sulfur in the samples taken in four experiments in the Audubon Sugar Factory from October 21st to 30th, 1957. Key: A = no bactericide; B = 10 p.p.m. bactericide B; C = 20 p.p.m. bactericide B; D = 40 p.p.m. bactericide B.

Table I. Reduction of Sucrose Losses by the Inactivation of Invertase by Means of Bactericides A and B.

	Bactericide	*Percent loss of sucrose after*		
Number	*P.p.m.*	*15 min.*	*30 min.*	*60 min.*
1	None	1.3	3.1	9.1
1A	None	0.2	0.6	8.8
Average		0.8	1.9	9.0
2	5 of B	0.2	1.4	4.9
2A	5 of B	0.0	1.8	6.6
Average		0.1	1.6	5.8
3	10 of B	0.0	0.0	6.0
3A	10 of B	0.0	0.2	2.5
Average		0.0	0.1	4.3
4	10 of A	0.0	0.0	0.1
4A	10 of A	0.0	0.0	0.0
Average		0.0	0.0	0.1

Furthermore, this type of bactericide is not affected by the presence of bagasse and other organic matter in the juice. This fact permits the introduction of the bactericidal solution ahead of the mills which receive dilute juice from the mills at the end of the tandem. In this manner, dilute juice containing bactericide comes into contact with all parts of these mills as well as the troughs and pipes which carry the juice to the clarifiers. Otherwise inaccessible portions of the mill are continuously treated, and slime accretion is removed and prevented from reappearing.

Finally, we shall turn to the matter of whether or not any residue from this type of bactericide is found in either of the two final products, the sugar and the molasses, when the bactericide has been employed in the recommended amounts. It is known that the organic sulfur compounds contained in these bactericides undergo changes when dilute solutions are subjected to the prolonged heating of the juice during clarification and evaporation. However, in order to obtain direct evidence for the absence of these bactericides from the sugar and molasses, five experiments were made during October 1957 in the pilot plant of the Audu-

bon Sugar Factory at the Louisiana State University to determine whether any detectable residue was present in the final products when known amounts of the bactericide A had been added to the raw juice.

Arrangements were made with Dr. Philip W. West to collect seven samples from each experiment and to analyze them employing methods selected and modified by him. Two types of chemical analyses were made for each sample: one for sulfide by a modified TAPPI method (4) and the other for cyanide and thiocyanate by a modification of the Aldrich method (1). Each method had sufficient sensitivity to detect a concentration of as little as one part per million.

The seven samples collected during each experiment consisted of raw juice, raw juice with a known amount of bactericide B, clarified juice, sludge from clarified juice, evaporated juice, sugar, and first molasses. Chemical analyses were made on each of the first four samples immediately following their collection and on each of the other three samples within 12 hours, with one exception; this experiment was repeated and the results were confirmed by subsequent analyses.

In experiment A, one batch of raw juice with no bactericide B was processed and sampled to determine the amounts of sulfide, cyanide, and thiocyanate normally present in the juice. While we did not expect to find cyanide and thiocyanate, it was surprising to find measurable amounts of sulfide in all samples except the first molasses (see Fig. 1). In order to determine whether sulfide was normally present in commercial production, we obtained samples of sugar and first molasses from each of two nearby sugar mills. These also contained measurable amounts of sulfide which were comparable to those found in the sugar and first molasses from the pilot plant. Again the absence of cyanide and thiocyanate was confirmed.

Experiments B, C, and D were made in the pilot plant with batches of juice to which 10, 20, and 40 p.p.m. of bactericide B had been added. These batches were processed and sampled as indicated above. The sulfide content of the raw juice with added bactericide immediately gave the expected increment of sulfide as compared with the raw juice alone (see Fig. 2). The sulfide content again increased in the clarified juice and sludge as compared with the values obtained in the first experiment. Then the sulfide content decreased sharply in the evaporated juice, the sugar, and the first molasses. It was concluded that no significant differences in sulfide content existed among all of the sugar and first molasses samples which had been analyzed, whether they were produced from juice to which bactericide B had been added or whether they were produced from untreated juice. In no case were cyanide and thiocyanate present. When it is remembered that these analytical methods were sufficiently sensitive and accurate to detect one part per million, we can conclude that bactericide B was not present in either the sugar or the first molasses.

In summarizing, a new and more complete approach for reducing sucrose losses in sugar mills is available by the use of the new organic bactericide B. This bactericide acts by preventing slime accretion in the mills, troughs, and other equipment contacted by the cane juice as it flows from the grinders to the clarifiers. As the direct result of preventing slime accretion, the main source of invertase is removed; however, bactericide B also inactivates significant amounts of invertase during the period of time normally required for the extracted juice to be transferred to the clarifiers. Finally, it has been established that bactericide B leaves no detectable residue either in the sugar or the first molasses.

Fig. 2. Sulfur content in samples taken in experiments A and B at the Audubon Sugar Factory from October 21st to 30th, 1957.

Acknowledgment

The writer gratefully acknowledges the assistance of Ingenieros Edward Jimenez Garriga and Ignacio Warner of Fosfonitro, S. A., Havana, Cuba. The former assisted the writer during the experiments at the Cuban mill and the latter during the experiments at the Audubon Sugar Factory.

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(3) Spencer, G. L., and Meade, G. P. Cane sugar handbook, 8th Ed. John Wiley and Sons, Inc. (1944).

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■

International Sugar Council

The International Sugar Council met in London on 22nd and 23rd April, 1958, under the chairmanship of D. J. Muir (Australia). The meeting was attended by delegates from 24 countries and by observers from five other countries and from the Food and Agriculture Organization of the United Nations.

The Council noted that 22 countries had ratified the Protocol amending the International Sugar Agreement. This includes the Republic of Indonesia which has acceded to the Agreement as amended by the Protocol and deposited its instrument of accession on 21st February, 1958.

The Council took note of a revised estimate prepared by its Statistical Committee of free market requirements for the calendar year 1958 amounting to a total of 5,610,000 metric tons, raw value as compared with its previous estimate of 5,515,000 metric tons, raw value.

The Council considered the progress made in connection with the arrangements for the negotiation of a new International Sugar Agreement at a conference to be held under the auspices of the United Nations in September, 1958.

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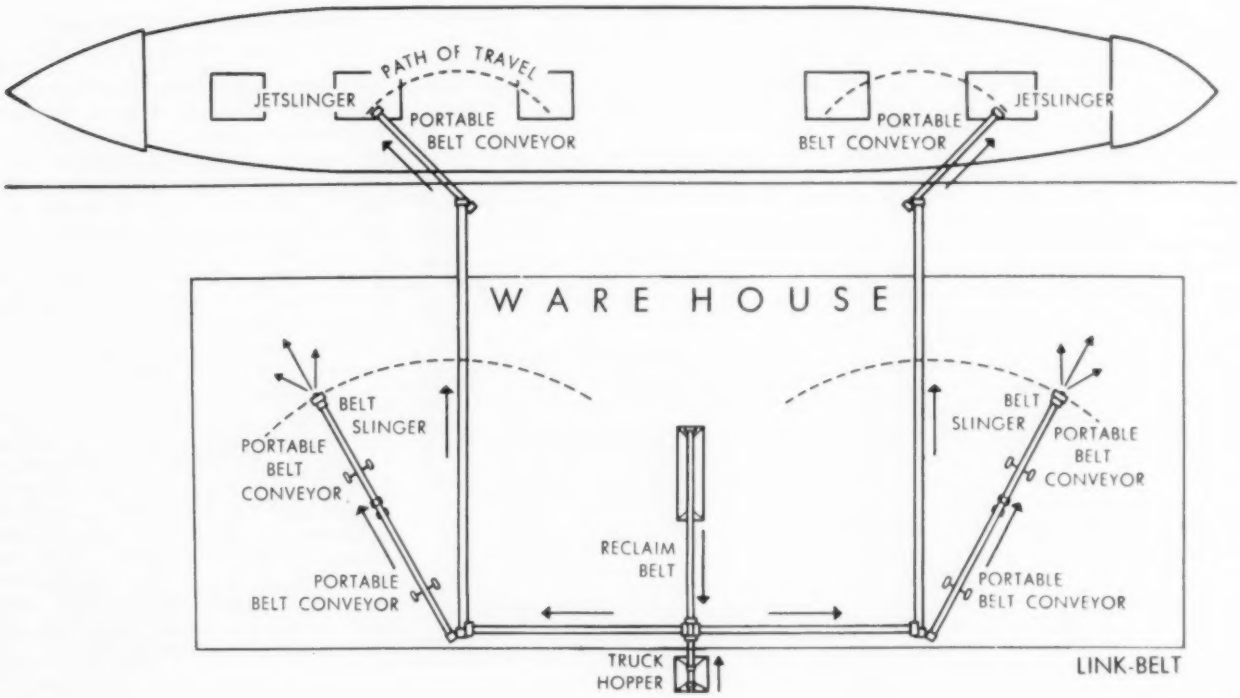
Commercial Coating Extender Derived from Sucrose

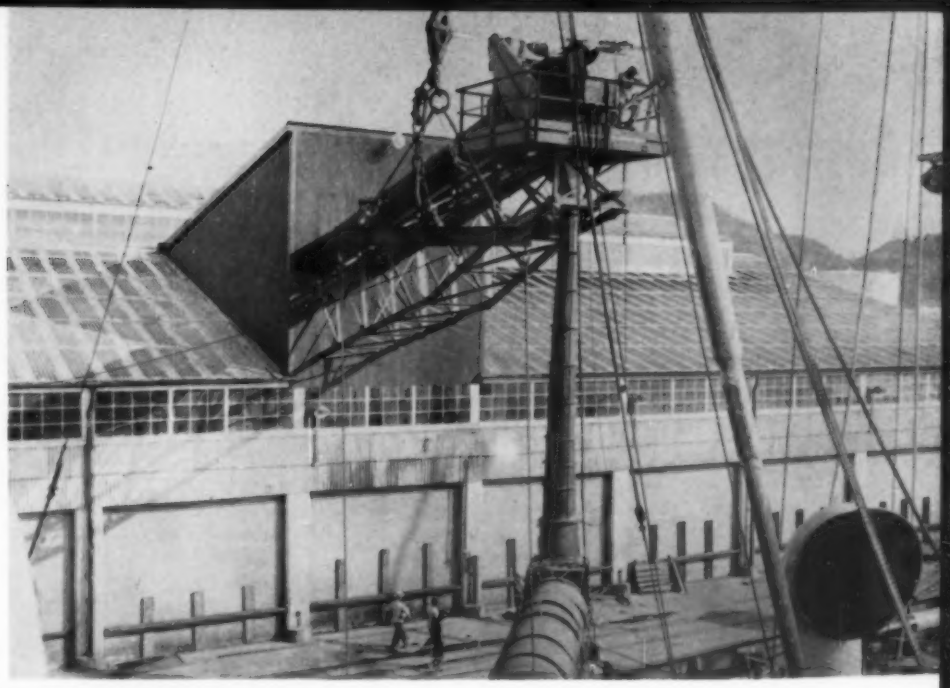
Commercial production of sucrose acetate isobutyrate, known as SAIB, was begun in April 1958 as a result of the work that has been done by Eastman Chemical Products Company, a subsidiary of Eastman Kodak. This company has been exploring the possibilities of sugar as an industrial raw material and has prepared many sucrose derivatives of which SAIB shows early commercial promise. SAIB is formed by the esterification of sucrose with acetic anhydride and isobutyric anhydride. The result is an extremely viscous clear liquid of high molecular weight with excellent stability and wide compatibility with most resins, film formers and plasticizers. Incorporated into coating formulations its behavior is intermediate between a resin and a plasticizer. Eastman plans to market its new product as SAIB-90, a solution consisting of 10 parts of ethyl alcohol and 90 parts of sucrose acetate isobutyrate. It may be used to extend and improve wood lacquers, paper coatings, cloth coatings, metal lacquers, plastic lacquers, hot melt coatings and peelable plastic coatings.

THE PROBLEM: Sugar Service Corporation, an operating company owned by Central San Vincente, Fajardo Sugar Company, Eastern Sugar Associates and Bull Insular Line, was faced with the problem of handling raw sugar shipments from over-the-road sugar plantation trucks to dockside warehouse storage and then re-handling the bulk sugar from storage to ship's hold. While this was essentially a simple materials handling problem, it had unique modifications. The Corporation held a franchise to operate pier facilities for a five year period. Because the Puerto Rican Government has elaborate plans for converting this section into a huge port area with permanent bulk handling installations no extension of the franchise could be counted on beyond five years. The installation must amortize itself within that period; it must provide efficient bulk handling without permanent loading equipment.

Versatile Installation In San Juan

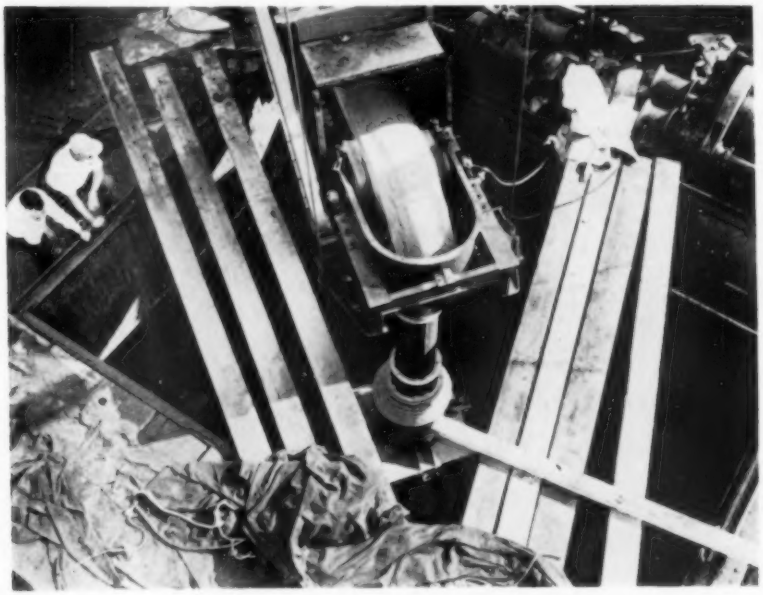
Bulk Loading With Jetslingers





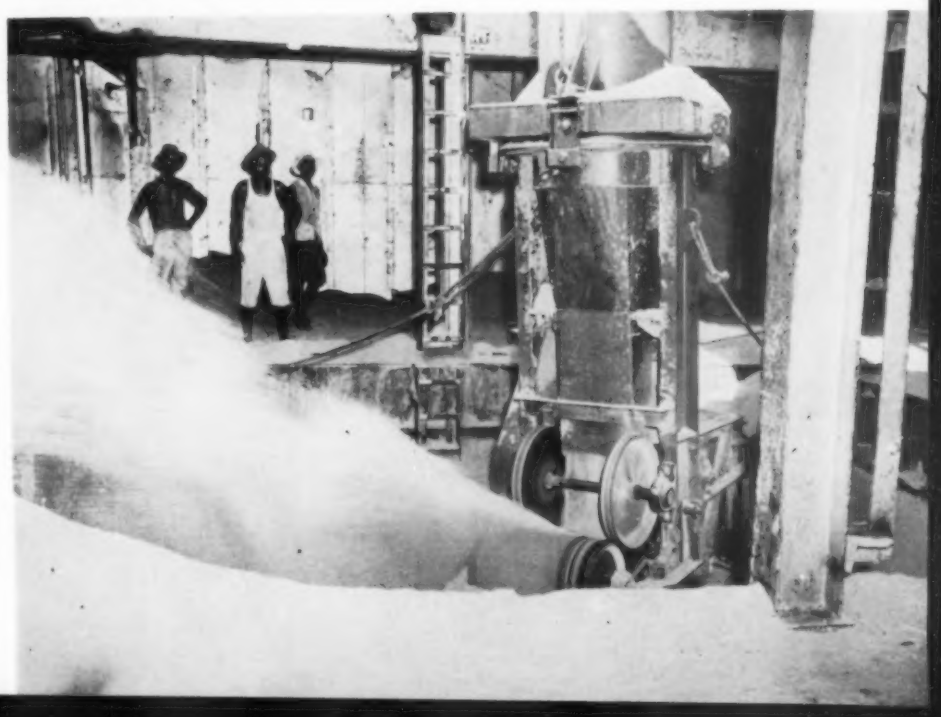
Raw sugar is delivered to the warehouse by self dumping truck as shown in the upper left hand illustration. Its course thereafter is illustrated diagramatically on the opposite page. From the hopper sugar falls into a tunnel where a Link Belt belt feeder delivers it at the rate of 200 tons per hour to storage or direct to the ships hold.

The new warehouse has a capacity of 12,000 tons but since it is anticipated that the installation, engineered by the Link Belt Company, would handle 300,000 tons in 1958 it was necessary for Link Belt engineers to select equipment that would move the sugar rapidly. The system was therefore designed around a series of belt conveyors and four Jetslingers. The Jetslinger is a short endless belt operated over two pulley drives at high speeds. Idler wheels form the conveying arc and the trajectory angle which can be adjusted by raising or lowering the front pulley. A chute above the Jetslinger directs the sugar onto the rear slope of the belt which slings the sugar into desired storage spaces both on the ship and in the warehouse.

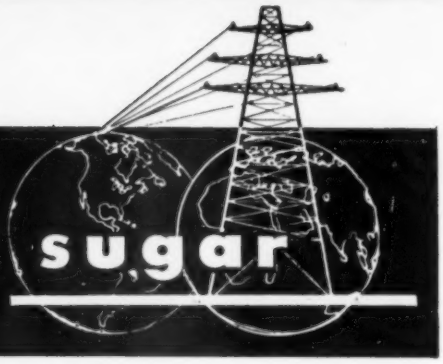


With sugar being delivered at the rate of 200 tons per hour from the truck hopper, and being loaded into the ship's hold at the rate of 400 tons per hour, it is possible to have 200 tons from the truck hopper supplemented by 200 tons per hour from the warehouse, or the entire 400 tons per hour from storage. Either of two inclined shiploading boom conveyors using a jetslinger can handle the entire 400 tons per hour, or split it in several patterns between the two booms.

As may be seen from the diagram, two of the Jetslingers are placed in the warehouse at the end of two portable belt conveyors. The other two Jetslingers are placed in the ship's hold to insure even distribution of the sugar. As illustrated at the top of this page, sugar is carried from the warehouse to the ship by inclined belt conveyors which discharge through telescoping chutes to portable conveyors on the ship's deck. In the center picture the portable deck conveyors may be seen discharging raw sugar through the telescopic chute to the Jetslinger. In the picture at the bottom of the page, sugar is being discharged from the Jetslinger into all areas of the hold. The Jetslinger may be raised and lowered by the cables that support it and which are handled by the ship's tackle. It may be rotated 355 degrees to direct the stream of sugar toward any part of the hold, and due to the velocity of the stream sugar fills the most inaccessible areas evenly. The unit illustrated has a capacity of 400 tons per hour and operates at 3,500 r.p.m.



facts about sugar



NEW YORK, MAY 5, 1958:—Refined sugar price advances of $.20 per 100 pounds were announced in most areas, starting on April 22nd, according to B. W. Dyer & Co., Sugar Economists & Brokers. National, followed by American, advanced in all territories, but on April 23rd the increase on industrial grades was rescinded in the Northeast area. Most cane refiners followed the advance in all territories. Beet processors advanced $.20, but took a 30-day booking at the old price, except on the West Coast where the advance was made effective at the close of business May 2nd.

The U. S. Department of Agriculture on April 23rd, prorated deficits in the sugar quotas of 200,000 short tons for Puerto Rico and 100,000 tons for Hawaii. The prorations for these areas follow: Domestic beet 125,-924; Mainland Cane 38,749; Cuba 135,327. The government's rationale stated: "These proration are being made because it appears that neither Puerto Ricon or Hawaii will be able to fill its quota. Sugar production in Puerto Rico has been affected by drought and the strike situation in Hawaii is limiting harvesting, processing, and marketing of this year's crop. Announcement of the actions at this time, while Cuba's harvest is still in progress, will enable Cuba to make appropriate adjustments in its production."

Domestic spot raw sugar prices were unchanged after the deficit reallocation, remaining at $5.75 per 100 pounds. Earlier in the month, the price had declined to $5.60 on distress sales.

The Hawaiian sugar strike, which started February 1st, was not settled at the time this was written. Although references to the 1946 strike quite naturally have been made, Donald Maclean, President of C & H, pointed out at the Sugar Club luncheon on April 22nd that the two strikes occurred at different periods of the year and were not statistically comparable. The C & H refinery resumed operations about mid-April, melting sugar from Cuba and the Philippines.

Picketing of N. Y. piers by some truckmen was halted by a court order signed on April 24th. This also resulted in suspension of the boycott, which was called by truckers on April 14th to protest the increased rates for loading and unloading trucks by waterfront terminal operators.—In San Francisco, representatives of West Coast longshoremen have voted to demand a 16¢ hourly wage increase when new contract negotiations begin on June 15th.

World raw sugar prices (#4 spot prices on the N. Y. Coffee & Sugar Exchange) advanced to 3.55¢ per pound early in April on threats of a general strike in Cuba. However, after the strike attempt failed, prices declined to 3.39¢.

Cuban sugar production during the first half of April amounted to 661,095 short tons, compared with 970,186 short tons during the corresponding period last year. This decline in production was attributed to rebel interference by some analysts. However, B. W. Dyer & Company believes the reduction was caused largely by the Easter holidays, which did not occur until the last half of April in 1957.

SUGAR PRICES MAY 5, 1958

Ex Duty Raw Sugar N. Y.	**5.75**
Average #6 Raw Sugar Jan. 1 to May 5	**5.64**
Refined Sugar Gross, N. Y.	**9.15**
#4 Raw Sugar (f.o.b.) Cuba	**3.42**
Average #4 Suger Jan. 1 to May 5	**3.54**

Future Prices	*Contract #6*	*Contract #4*
July 1958	**5.75**	**3.41**
September 1958	**5.77**	**3.43**
October 1958	...	**3.38**
November 1958	**5.77**	...
March 1959	...	**3.37**
May 1959	...	**3.37**
July 1959	...	**3.40**

According to Licht's estimate of April 15th, the sugar area of Western Europe for 1958/59 was placed at 4,591,000 acres compared with 4,040,000 in 1957/58. Europe, excluding Russia, is estimated at 7,360,000 against 6,670,000. Russia is estimated at 5,550,000 acres against 5,310,000 last season.

Russia bought 78,000 tons of sugar from the Cuban Institute at 3.28¢ per pound during April, which was substantially below the spot price at that time. Later, it was reported that an additional 10,000 tons was bought, bringing total Russian purchases from Cuba to 188,000 tons this year. Last year, Russia imported about 350,000 tons from Cuba.

Red China bought 50,000 tons from Cuba, and Cuban sales to the world market (outside U. S.) through April 30th were 1,820,-691 short tons, according to a survey by Willett & Gray, Inc. During the corresponding period last year, Cuba's world sales totaled 2,378,348 short tons.

The world spot price advanced to 3.47¢ on April 24th, but then declined slightly after that, and was 3.42¢ on May 5th.

Cuban Sugar Institute members are meeting with Department of Agriculture officials to discuss the size of the Cuban crop, which was restricted to 6.24 million short tons. Agriculture officials apparently are concerned that this outturn may be inadequate to fill additional Hawaiian and Puerto Rican deficits, if they should develop. There is an estimated surplus of cane in Cuba equivalent to at least 800,000 tons of sugar. However, some of the surplus cane is already being used to make invert molasses, B. W. Dyer & Company concludes.

Modernization Recommended For Cuba

HAVANA:—There was moderate optimism in Cuban sugar circles as the revolutionary activity decreased greatly during the last weeks of April. The increase given the Cuban quota in the U. S. of 135,327 tons, as well as the raise in price of refined sugar by the National Sugar Refining Co. and the American Sugar Refining Co. added to this favorable attitude. Nevertheless many of the mills of Oriente province, the hardest hit by the revolutionists, are reported to be running low of fuel, and may have to suspend activities before reaching quota.

A look at the Cuban production by provinces up to April 15th would give us the following picture (with 29 mills having terminated grinding operations):

	Short Tons	*Gls. Molasses*
Pinar Del Rio	**191,000**	**6,755,919**
Habana	**426,000**	**16,486,333**
Matanzas	**615,000**	**20,494,177**
Las Villas	**1,120,000**	**36,488,467**
Camaguey	**1,395,000**	**48,063,410**
Oriente	**1,330,000**	**47,948,863**
	5,077,000	**176,237,169**

Up to date the leading producers (short tons) are the following mills: Moroñ—1,200,000; Vertientes—1,160,000; Jaronu—1,060,000; Manatí—1,040,000; Stewart—902,000; Preston—840,000; San Germañ—835,000; Baraguá—823,000; and Delicias—795,000.

Best yield to April 15th was registered at the Isabel (G) mill—14.84%.

The bagasse plant at Cruces, L. V., which will be operated by "Cuban Bagasse Products S. A." is expected to be inaugurated shortly. The expected production is 20,000,-000 square feet of board, for which 40,000

to 45,000 tons of bagasse will be required. The board that will be produced is considered to be an excellent substitute for plywood.

During the month of April Cuba was visited by a distinguished delegation of sugarmen from Formosa with the object of inspecting mills and observing the systems of grinding and transportation which are here employed.

They were received by Salustaino Garcia, President of the Hacendado Association, and Mr. Aurelio Portuondo.

Among the delegation were J. C. Huang, Vice-president of the Taiwan Sugar Corporation, and David T. K. Tao, Sidney E. K. Chen, Hugh Y. Lee, and T. J. Chen.

Julio Lobo highlighted the month by making some interesting declarations as to conditions in the Cuban sugar industry.

Cuba should increase its output of sugar "this very year" to meet the demands of a sugar-hungry world, and undertake a gradual but eventually total modernization of its sugar industry.

Cuba, stated Mr. Lobo, cannot afford to reduce its production; "Our efforts must be aimed at accomplishing conjointly with other exporting nations, an increase in world consumption of sugar. Cuba should produce more sugar—never less." And specifically, produce more this very year, as the global sugar situation warrants it.

Many of last years sugar-exporters "in competition with Cuba," have become importers or have ceased to export—Italy, Spain, Argentina, Venezuela, Indonesia, "and especially our new buyer, Red China, to whom the I C E A sold 50,000 tons only yesterday." The sugar strike in Hawaii which has lasted more than three months and damaged "its current crop and next years crop," and the disastrous drought in Puerto Rico are also factors pointing to the feasibility of larger production for Cuba. Between the two areas there must be calculated a drop of some 500,000 tons which void must be filled "almost entirely by Cuba." Increased production, continued Mr. Lobo, would mean "an additional month of work for the field hand as well as the mill worker," and it is much better to have "sugar in the sacks than uncut cane in the fields."

Julio Lobo also made a call on the Cuban industry for modernization. He noted that the last mill constructed in Cuba was in 1924, thirty-four years ago. In the meanwhile the increase in world sugar production has been enormous, from 25,000,000 tons in 1925 to 45,000,000 tons in 1958, which increase has been accomplished with new and up-to-date mills. Only last year 32 new sugar mills were set up with ultra-modern systems of cultivation, transportation, production, and shipment. "In order to meet this competition we must reduce costs, modernizing our methods and mills, since greater production means lower costs."

Mr. Lobo stressed that modernization of the Cuban sugar industry should take place in each and every operation, from the plowing of the earth to the shipment of sugar in bulk form and "going into sugar-by products on a commercial scale." "This modernization program," continued Mr. Lobo, "which should have commenced long ago does not imply throwing men out of work." "On the contrary, modernization would call for new industries using bagasse—and derivatives of molasses and 'cachaza,' and this would require a great number of workers. This is why we defend . . . the idea of modernization without unemployment, modernization with diversification."

Mexican Production Exceeds '57

MEXICO CITY—Mexican sugar production this year will exceed last year's totals.

A National Union of Sugar Producers official production release stated that 792,144 tons had been produced by April 5th. This figure is 89,555 tons more than was registered by the same date last year.

A total of 73 mills were active in this cycle (the San Martin Mill in Guerrero has completed grinding), of the 86 mills associated with the National Union.

Internal consumption to the same April 5th date crossed 230,000 tons and exports totaled 61,800 tons.

For the current year, Mexico will ship (by quota agreements), 34,210 short tons to the United States and 82,700 tons to the world market. Negotiations are under way to boost the U. S. quota.

Actual production figures for this year are expected to reach or cross 1,212,000 short tons (as compared with 1,120,000 for the 1956-57 cycle). This year's internal consumption is expected to hit 1,045,000 tons (as compared to 985,000 last year).

Undeniable fact is that Mexico's sugar industry, after some years of backing and filling, is steadily surging forward again. The industry has developed plans for amplification and building of new mills, with a short-term goal of at least 1,595,000 short tons possible in the next few years. This, according to industry leaders, is a conservative estimate.

The trend to modernization and technical improvement is being spurred by private mills, the producer's union and the National Sugar Cane Commission. This latter organization has recently completed studies for establishment of new mills in various areas. As a result, one new mill is scheduled for construction in *Valle de la Resolana* (Sunny Valley) in the state of Jalisco.

Main stumbling block, as in the past, is the lack of money. Of the total $42,500,000 loan just granted Mexico for various projects, by the World Bank, $2,500,000 has been earmarked for modernization and expansion of the El Potrero Sugar Mill.

Private capital is to be sought and there has been talk of floating a bond issue to raise funds for a complete overhaul of the lower third of Mexican mills.

The National Union of Sugar Producers, for its part, is engaged in intense studies to give the industry "maximum profits" from exploitation of by-products. Object of studies is (1) to promote the use of derivative products and (2) amplify industrial uses of sugar. Plans have progressed for utilization of bagasse for newsprint here and studies are going forward for development of chemical products, cane chaff for chickens, etc.

Most outstanding example of technical progress by a mill in Mexico is the San Cristobal installation of Veracruz. The production at this mill this year will be the largest in the history of the industry. Latest report gave a production figure of 88,500 tons and the total is expected to hit 175,000 tons when the season ends.

This $40,000,000 mill, the largest in the world grinds 14,000 tons of cane daily, producing 1,305 tons of refined sugar.

Damage To Hawaiian Crop Imminent

HONOLULU:—Complete shutdown of the Hawaiian sugar industry by a strike of workers who are members of the International Longshoremen's and Warehousemen's Union (ILWU) moved into the fourth month on May 1st. Statements by union and management have been made that they can hold out for another six to ten months.

The longest previous strike in the Hawaiian industry was 75 days in 1946.

Favorable weather, which has been wetter and cooler than usual, has helped keep damage to a minimum. As more than half the acreage is irrigated, rainfall has saved heavy losses. However, only the most unusual summer weather will keep fields from suffering heavy losses during the next few months. Already several small fires have been reported.

Hawaiian Commercial & Sugar Company on Maui reports that "red rot" disease has hit heavily in some 44 acres of variety 38-2915 cane. This variety is planted in more than half the 14,499 acres of the huge plantation. As the cane cannot be harvested due to the strike the disease may spread.

Conditions are somewhat improved on the marketing side of the Hawaiian industry. The industry's big California & Hawaiian Sugar Refining Corp. is now operating on foreign raws; however the ILWU controls the warehouse and shipping departments of the refinery and threatens to shut down the plant if progress is not made in the Islands.

Help for striking sugar workers has been pledged by mainland members of the ILWU, and support has been offered from the International Longshoremen's Association, water front union on the U. S. east coast.

On the surface the strike is entirely over wages; however a long series of labor-management problems have beset the industry

for years. The union demands a 25¢ per hour wage increase for a one-year contract. Initially, the plantation companies offered 4¢. More recently, they offered a wage increase totaling 15¢ for a two-year contract. The union said this was no basis for settlement.

Plans for a new million dollar bulk sugar terminal at Kawaihae, Hawaii, to serve Kohala Sugar Co. were made known recently through application for a long lease on shoreside property. Castle & Cooke, Ltd., which owns the sugar plantation company as a subsidiary, outlined requirements for property upon which to build molasses and aqua ammonia storage tanks, in addition to the bulk terminal. This is the first announcement of plans for construction at the new fairweather harbor for deep-draft vessels now under construction on the northwest shore of the Big Island of Hawaii. Army Engineers explain that the harbor will be dubbed "fairweather" until a proposed breakwater is built.

Fire swept the Olaa Mill and part of the boiling house of the Island of Hawaii plantation. Damage ran to some $65,000 on the building. Equipment losses were not immediately determined. Repairs are expected to be made while the plantation is shut down as a result of the labor walk-out. Fire is thought to have started from a welding torch being used on a reroofing project by an outside contractor.

A variety of cane—known to plantations as number 44-3098—has been replaced as the most widely planted cane in the Hawaiian sugar industry after leading for six years. Variety 37-1933 now leads in both total area planted and in acreage planted. This variety is grown only on irrigated plantations. It is the outstanding variety in its environment with high juice quality and high sugar yields.

Variety 37-1933 is claimed by the Hawaiian industry to hold three world records in yields. In 1950, Ewa Plantation Co. achieved 14.14 tons of sugar per acre. In 1953, Olokele Sugar Co. on Kauai broke this record with 15.11 tons per acre. Again, in 1955, Olokele broke their own record with 15.52 tons of raw sugar per acre. This is claimed by the Hawaiian industry to be the present world record for plantation-size acreage. It has not been publicly disputed to date.

Turkey's Beet Crop

ISTANBUL:—The beet sugar factories of Turkey have completed their crop with a total production of 352,000 short tons of refined sugar and 3.9 million gallons of alcohol. Factory recovery was 84.5%. Acreage was 370,000 yielding 2.2 million tons of beets. Consumption is estimated at 294,000 short tons and exports at 29,700 tons. Inadequate fertilization coupled with unfavorable weather are said to account for the poor yields. Only 34% of the optimum quantity of fertilizer was applied last year, compared with 47% in 1956.

Puerto Ricon Research Commission

ISABELA:—Under a law approved last year a Consultative Commission for Research in the Sugar Industry of Puerto Rico has been set up.

This law assigns to the Experimental Station of the University of Puerto Rico the sum of $50,000 for scientific research on any phase of the industry, and the Rector of the University is empowered to receive grants from private sources for the same purpose. This Commission is composed of Arturo Roque, director of the Station who also serves as president of the Commission; José Acosta Velarde representing the government; Manuel Gonzales Quiñones representing the sugar cane colonos; J. M. Guzman representing the sugar factories; José Caraballo representing labor; Rubén Bonilla, as extension counselor; and Luciano Fuertes representing the Department of Agriculture and Commerce. The principal aim of the Commission will be to increase the yield of sugar so as to meet the competition of other countries supplying the world market, and will include studies of cultural methods, factory processes, mechanization of equipment, and marketing methods.

As of April 26 there were 30 factories in operation which have processed 5,640,821 tons of cane producing 600,958 short tons of sugar. The sugar yield was 10.654% on cane, which is considered low for this year. It is a cause for worry in the industry that the campaign, which started off with extremely low yields, is not reaching the yield levels usually expected in March and April, and it seems that the 10-year trend of low yields is to continue this year.

P. R. 1013 is a new variety which has passed all tests by the Agricultural Experiment Station and is recommended for commercial propagation. This variety compares favorably with other varieties in production, resistance to disease and adaptation to various regions of the island and is as good a yield as P. R. 980, which is regarded as one of the best now in use.

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Six Million for Mexican Mill

Ingenio "El Potrero" S. A., an important sugar producer in Mexico with a mill in the Vera Cruz area, is undertaking an expansion program at a cost of $6 million. The Export-Import Bank of Washington, D. C., is providing $3 million for the purchase of United States equipment, materials and services, according to an announcement by Lynn U. Stambaugh, first vice president of the Export-Import Bank. The expansion program for the mill is expected to be completed in the fall of 1959 and will increase annual production of refined sugar from 55,000 to 90,000 metric tons.

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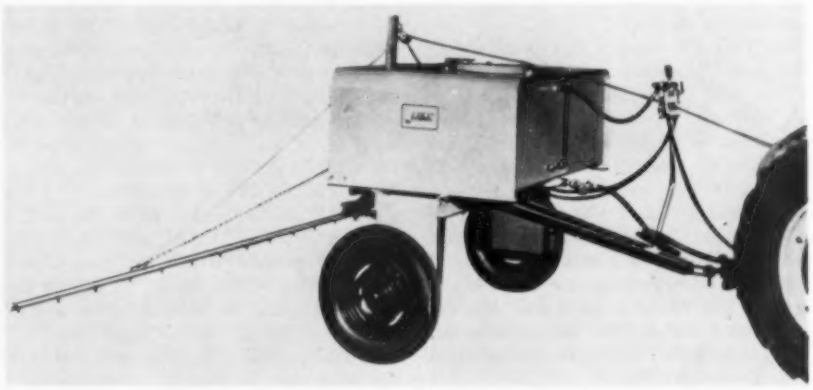
Applying Fertilizer and Herbicides

In the recent past the sugar industry has begun to place heavy emphasis on fertilization, chemical weed control and increasing the productivity of the agricultural labor force. In light of this preoccupation, the announcement of a new general purpose sprayer capable of handling liquid fertilizers and herbicides is of special interest. The unit has a capacity of 250 gallons and may be used with power take-off or engine driven. Boom accessories are available for spraying. Tread is adjustable from 72 in. to 84 in. with 29 in. crop clearance under the tank. The power take-off model delivers nine gallons per minute at 100 lbs. pressure at 550 rpm. The engine driven unit delivers 11 gpm at 50 lbs. pressure operating at 800 rpm. The unit is manufactured by the John Bean Division, Food Machinery & Chemical Corporation.

General purpose sprayer for liquid fertilizer and herbicides recently announced by John Bean.



Sugar's Progress in

HUMAN RELATIONS

Roy J. Leffingwell

Profitable Performance Out of People

BUSINESS success today requires more than making and selling. It also demands that we do these things at a profit.

Slowly the world is beginning to understand that to get profitable performance out of people—and this includes executives, superintendents, foremen, rank-and-file workers, dealers and customers—is the most pressing problem of management. By comparison, the handling of money and machines is easy.

The sugar industry is faced with a special problem today. That is mechanization. It may come as a surprise to many to learn that Cuba, one of the last strongholds of hand methods, has made advances in the use of machines in all areas, except in planting and harvesting. The price squeeze on profits is forcing consideration of mechanization in these areas.

Mechanization in free-world sugar industries is inevitable. It is the only means by which human beings can earn more, and still allow the producing companies to stay in business. However, this transition from hand labor to the use of machines is a difficult one. It requires unusual skill, and skill in an area of which most of the sugar producing regions have little knowledge.

First, is the problem of dealing with public opinion. The people of democratic countries must be told of the necessity of using machines in place of manpower. The public must understand "why," because the shift from men to machines causes displacement of labor. Cuba is faced with this major problem now. As they move to mechanization in planting and harvesting a large number of laborers will be cut off the payroll.

Second, is the problem of gaining the understanding, cooperation and performance of workers who remain to handle the machines. A loafing man who has only a hoe to operate may not be too serious. But, a worker who loafs with a $50,000 machine can cause serious financial loss to the sugar producer.

There is no easy way to learn how to deal effectively with people. But, we know a great deal more about human behavior today than practically any sugar area is putting into use. Scientists have for the past quarter-century successfully probed into trouble spots in industrial relations.

And, a great deal more study should be given by sugar producers to methods used by areas in which mechanization is well advanced. Hawaii, as one example, has advanced far in mechanization. All of their cane is mechanically harvested. They haven't solved all of the human relations problems, but through trial and error methods they have worked out some solutions.

Hundreds of sugar producers travel to Hawaii annually to see the advanced machines and agricultural practices. To my knowledge, few have been the slightest bit interested in how the human relations problems of mechanization have been tackled.

Profitable performance of the future will depend primarily on the success we have in dealing with people. It is time we in the sugar industry spend more time in this vitally important task.

Let's interrupt our employee benefit series long enough to look at an actual strike case study and see what happens to workers involved in a long labor strike.

The case is the 1958 sugar strike in the Hawaiian Islands in which the union completely shut down all field and milling operations. Some comparative information is available as in 1946 the same industry suffered a similar shutdown for 75 days.

In 1946 there were some 23,000 employees and today, because of increased mechanization, the number is about 15,500. Twelve years ago employees largely lived in company-owned housing. Today, more than one-quarter own their own homes. The standard of living is high and most workers own an automobile, radio, television and electrical appliances. Most of these items are purchased by means of a small down payment, and long-time monthly payments.

Public opinion would not allow the sugar companies to put workers out of plantation homes in 1946 because workers could not pay rent. It was thought by many that the situation would be different in 1958 for those who had financed homes through private organizations. And, it was thought that the dealers would be forced to take back all merchandise on which payments were not made.

However, these actions did not occur. Financial institutions realized that if they tried to dispose of this quantity of houses, automobiles, etc., it would panic the market. A comment was made by one dealer that there was not storage space enough on the Island of Hawaii to put the many items upon which payments had not been made. The result was that few, if any, repossessions took place.

Workers used up what savings they had, withdrew from credit unions, and extended their credit to the limit at all stores. The union started the strike with nearly $1 million in a strike fund; however, they did little to help individual members.

Union discipline was very tight. Passes were required to leave the plantation area. Fishing and hunting groups were organized early. Workers were urged to find work elsewhere, but required to pay 25% of their earnings into the union strike fund.

Basic wage rates in the Australian sugar industry were increased this year by three shillings for adult males (about 30 cents U.S.) and two shillings for females, per week.

Canegrowers in the Australian industry who are in critical financial condition due to the drought which hit that area last year are entitled to unemployment relief. Rates for this relief run from three pounds, five shillings (about $6.50 U.S.) per week for single men to six pounds, two shillings and six pence (about $12.25 U.S.) for a married man with wife and children.

Imperial Sugar Company, at Sugar Land, Texas, recently launched a six months safety campaign to follow up their almost perfect safety record of last year.

Imperial also got off to a good start on the first year of their employee pension plan in 1957. A year-end report showed that 592 employees were members of the plan and they contributed a total of $58,975 to the fund. The company contributed twice this amount.

The Hawaiian Sugar Planters Ass'n. has developed a set of teaching aids on the sugar industry for use in grades 6, 9 and 12 of public and private schools of the Territory. Material is presented in the form of flip charts with words and pictures large enough to be seen across a school room. The subjects covered are: "The Story of Sugar in Hawaii," "Sugar's Place in Our Community," and "The Economic and Social Importance of Sugar in Hawaii."

The Economic Basis for Utilization of Bagasse

By L. F. Martin

Southern Regional Research Laboratory*
New Orleans, Louisiana

SUGARCANE yields approximately as much fiber as raw sugar, although proportions of the two products vary considerably from this average in different areas where cane is grown. Large quantities of the cellulosic fiber are accumulated in the bagasse remaining after sugar is extracted by the mills. More profitable uses of this fiber than burning it to provide steam for the factories have been sought diligently for more than a century. A few economically sound applications have been developed with signal success, but most of the 25 million tons of dry bagasse fiber estimated to be produced annually is still burned. It is pertinent to ask why the successful applications have not been expanded greatly, and why other potential uses of this abundant raw material have not materialized. One answer is that the paramount importance of economics in utilizing bagasse industrially has not been as obvious to others as it appears to those who have thorough knowledge of the production of sugar from cane. An extreme, but by no means unique example of miscalculation of the availability of bagasse is furnished by a report of plans for production of resin-impregnated hardboard at the Kekaha Sugar Company in Hawaii [1]. It states that 8-10 tons are obtained for every ton of raw sugar produced, and that half of this is surplus to the fuel requirements of the factory. Records of production at Kekaha [2] show that only 7.7 tons of *cane* are used to produce a ton of raw sugar; less than 0.9 tons of dry fiber are milled per ton of raw sugar produced. Only one-fourth of this would be surplus, assuming the most efficient operation of the quintuple effect evaporators and other equipment of this factory, providing about 10,000 tons of dry fiber from the annual sugar production of 50,000 tons. Hardboard is being produced economically from bagasse in Taiwan [3]. The process proposed at Kekaha may have been entirely feasible technically, but economics would have proved the undoing of a venture predicated upon a supply of raw material 20 to 30 times the quantity actually available.

There have been numerous records of the production of satisfactory paper from bagasse, particularly for newsprint, which was used in editions of the Baltimore Advocate and the Philadelphia Public Ledger as early as 1856. From that time until about 1890 ventures in bagasse paper manufacture continued, and some enjoyed a measure of temporary success. The New Orleans Picayune was printed on such paper in 1884. During the same period the National Pulp, Paper and Cordage Company made 1400 lbs. of soda pulp per day at Marrero, Louisiana, where the Celotex Corporation now uses bagasse for production of structural insulating board. A successful paper manufacturing industry based upon the use of worthless waste material that plagued the sugar mills in Louisiana seemed to be assured before the turn of the century. This did not come about because of two revolutionary inventions. In 1886 Samuel Fiske built the first successful furnace for burning the residue efficiently to provide at least a part of the large steam requirements of the factories that had been generated by burning expensive wood or coal. Multiple effect evaporators developed earlier by Rillieux came into general use at about this time; in conjunction with Fiske's bagasse furnace, this innovation made it possible to obtain all of the steam required from the fuel value of the factory refuse. Bagasse was no longer a waste material. Its cost had to be reckoned in terms of the prices of alternative fuels, and proved too high for survival of the infant paper industry.

Availability of cheap natural gas in Louisiana since 1920 has made all of the bagasse in that area attractive for other uses, as it was prior to 1890 when its fuel value was negligible because means of burning it efficiently had not been developed. New cane varieties harvested after a short growing season have a relatively high fiber content, and more fiber is produced per ton of sugar than in any other cane growing area. Despite these advantages, the products that have been commercialized consume less than half of the annual production. Celotex manufacture uses about 35% obtainable within a radius of 100 miles of the plant at Marrero. Molding plastic, paper, horticultural mulch, farm litter, and bagasse-molasses feed are made from about 10%, leaving more than half the supply to be burned. In contrast with Louisiana, some tropical areas harvest cane of lower fiber content that has grown twelve to eighteen months, requiring only 8-9 tons to produce a ton of raw sugar. With less than a ton of dry fiber per ton of sugar, all of the bagasse does not suffice to provide the steam required by factories that are not highly efficient, necessitating the use of much more costly supplemental fuels.

Other papers in the symposium report on representative processes that have been established commercially to utilize bagasse, and on promising potential uses still undergoing development. Some include discussion of economic aspects as well as essential technical data or experimental results pertaining to these processes. As a background for these reports, definitions of the economic variables and general relationships among them that can be developed for application to any uses, existing or proposed, are essential (Table 1). Data for particular processes will have to be supplied for the different localities in which it is proposed to use them. Analyses of the economic factors contributing to the success of established uses that are profitable commercially should provide the best guide for predicting the probable success or failure of novel processes or products utilizing bagasse. The early history of the development of Celotex recorded by Lathrop [4] is most instructive with regard to expanded or new uses of bagasse. The subtitle of his article raises the question, "Bagasse or Sugar a Byproduct?" The 25 years that have elapsed since the article appeared have answered this question; sugar is still the product, and bagasse is the byproduct that will find wider applications if they are developed along sound economic lines.

As soon as the feasibility of a process for converting bagasse to a potentially useful product has been demonstrated by laboratory experiments, thorough economic analysis should precede expensive pilot plant or semi-commercial development. Marketability of the product and an estimate of the volume that can be sold must be established at the outset, and may require limited pilot plant production to provide enough of the product for evaluation. Survey of potential markets and exploration of possible applications for a novel product are faciliated by making adequate trial quantities available. The forecast of probable demand at prices that will return a profit can be made more accurately for products, such as paper, intended to compete in an established market supplied by other raw materials. As exact knowledge as possible of the quantities that will be required is essential in the choice of an area from which raw material can be obtained economically. Market appraisals of

*One of the laboratories of the Southern Utilization Research and Development Division, Agricultural Research Service, U. S. Department of Agriculture.

the major current uses of bagasse by Goldsborough and Anderson [5] illustrate data that must be assembled and techniques for analyzing them. Their study included paper and paper board, pulp, building fiber board, furfural, and dehydrated bagasse which compete with similar products produced from other raw materials in existing markets. Particular attention is given to trends in these markets and forecasts of the future competitive position of production based upon bagasse. While the economics of marketing are beyond the scope of this discussion, principal factors considered in the analysis are: industry and market growth, price and profit trends, relative quality of the product from bagasse and from competitive raw materials, and market competition.

The next step logically will be to find sources of bagasse in quantities sufficient to produce the estimated volume of product, and to choose the one that is located most strategically with respect to a suitable plant site and the marketing territory. Statistics are available on production of sugar in all of the cane growing areas of the world, but the rough approximation that equal tonnages of dry fiber and sugar are produced in these areas will not suffice. Fiber production of individual mills ranges from as little as 0.7 tons per ton of sugar in Hawaii to almost 2 tons in Louisiana. All factories are not equally efficient in extracting and recovering sugar, with the result that fiber production varies locally within sugar producing areas. The trend of production must be projected from records over a number of years, taking account of variability from season to season, and foreseeable developments in a dynamic industry that will affect future supplies of byproduct bagasse. For example, the Louisiana industry recovered rapidly from the low production of 1926 caused by mosaic disease; subsequently, introduction of new, disease resistant canes of higher fiber content, conversion from hand to mechanical harvesting during the war, and changes of the production pattern under revisions of the quotas, all have required adjustments in industries using byproduct bagasse in that state.

The cost of bagasse that can be replaced economically by other fuels is obtained graphically from the chart published by Gastrock and Lynch [6]. It is based upon the range of heating values of bagasse and of the alternative fuels, gas, oil, or coal. Boiler efficiencies of the factories are also taken into account. The Celotex Corporation has paid 50¢ per ton of dry fiber more than the exact current replacement cost of natural gas. The future trend in consumption and price of any alternative fuel selected is important; the cost of bagasse has fluctuated with changes in the price of gas in Louisiana. In the tropics where most of the cane is grown, fuels that can replace bagasse are not available locally, and are costly to import. A concession was made by the government of the Dominican Republic to provide oil duty-free for ten years as replacement for bagasse diverted to production of furfural at Central Romana in that country [7].

Where alternative fuels are not available, or too expensive, the quantity of bagasse surplus to factory requirements must be estimated, and its value cannot be calculated so simply. Modern factories are able to operate at sufficiently high thermal efficiencies to have some surplus. Where there is no profitable outlet, utilizing less than maximum thermal efficiency is the easiest means of disposing of any excess. The potential heat economy of installed equipment should be analyzed in estimating quantities that might be available, as well as records of current operation. The principles upon which a sound calculation can be based were developed many years ago by Webre [8], and can be applied to heat balances of individual factories with up-to-date estimates of average percentage of fiber in the cane being ground. Mill practices are important, because the amount of water used in maceration affects fuel requirements as much as the fiber content of the cane.

Suaréz-Carréño [9] has calculated that an efficient factory will have a deficit when 25% maceration water is used on cane containing 11% fiber, whereas a surplus of about one-third of the bagasse (31.4%) is available from 13% fiber cane to which 15% maceration water is applied. Villamil [10] reported a surplus of nearly 40 % in a factory producing invert molasses during the 1954 Cuban season, which might have been increased to half of the total bagasse by installation of more efficient, modern boilers; this was possible only because no sugar was being crystallized.

A more practical estimate for normal seasons with present mill and factory equipment is 15% [11], about half of the calculated maximum surplus.

The fact that sugarcane grinding is a seasonal operation in most areas is worth emphasizing, because it should be obvious that bagasse must be stored for year round operation of any process using this raw material. All of it is produced during two months of grinding in Louisiana; at the other extreme, Hawaiian mills grind during 7-10 months of the year. Storage for several months in large piles allows time for fermentation of residual sugars and reduces moisture content, which has a desirable preservative effect at the expense of some loss of fiber. Experience has shown that handling costs are much higher than the price paid for the material leaving the mills, even though large tonnages may be concentrated incidentally in the process of manufacturing sugar from cane. These cost have been estimated by Keller [12] for Louisiana as of 1952, when bagasse purchased for $2.50 per bone dry ton cost users about $11 per ton of dry fiber delivered to plants drawing upon a supply within a 100-mile radius.

(*Continued on page* 38)

Table 1. Economic variables governing availability and cost of bagasse as a raw material

Volume of Bagasse Required [5]:	
Non-Competitive or New Product	Territory Potential demand Quality or properties required Price relative to volume Market development and market costs
Competitive Product	Territory and trend of distribution Volume and volume trends Prices and price trends Marketing costs and cost trends Quality differentials and improvement
Bagasse Supply:	
Total Bagasse	Production area relative to market Cane and fiber production & production trend Production season {Storing & handling / Seasonal processing} Production restrictions (quotas) Alternative fuels (6) {Present cost / Supply & cost trends}
Surplus Bagasse	*First four* of above variables Present Surplus Factory efficiencies (8) Efficiencies attainable {Existing equipment / Improved equipment}
Development Costs [13]:	
New Product	Pilot plant development Market exploration Semi-commercial development Relation of cost to volume
Competitive Product	Limited pilot plant development Quality improvement Cost reduction

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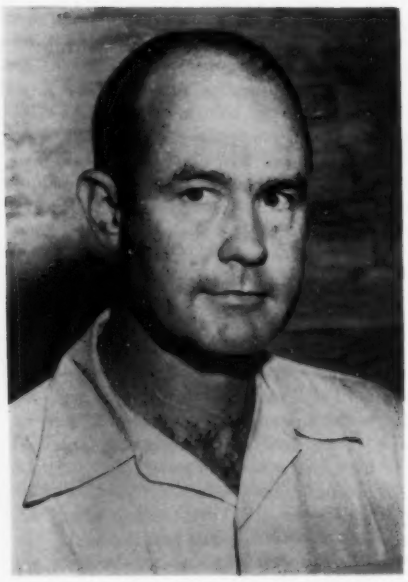


David W. Larsen

Formerly manager of Kilauea Sugar Company on Kauai in the Hawaiian Islands, **David W. Larsen** becomes manager of two large sugar plantations owned by W. R. Grace & Company and the famous Paramonga bagasse-paper plant in Peru. Combined production of the two plants is 120.000 tons of refined per year. In addition to the paper plant there is a distillery.

James H. Tabor

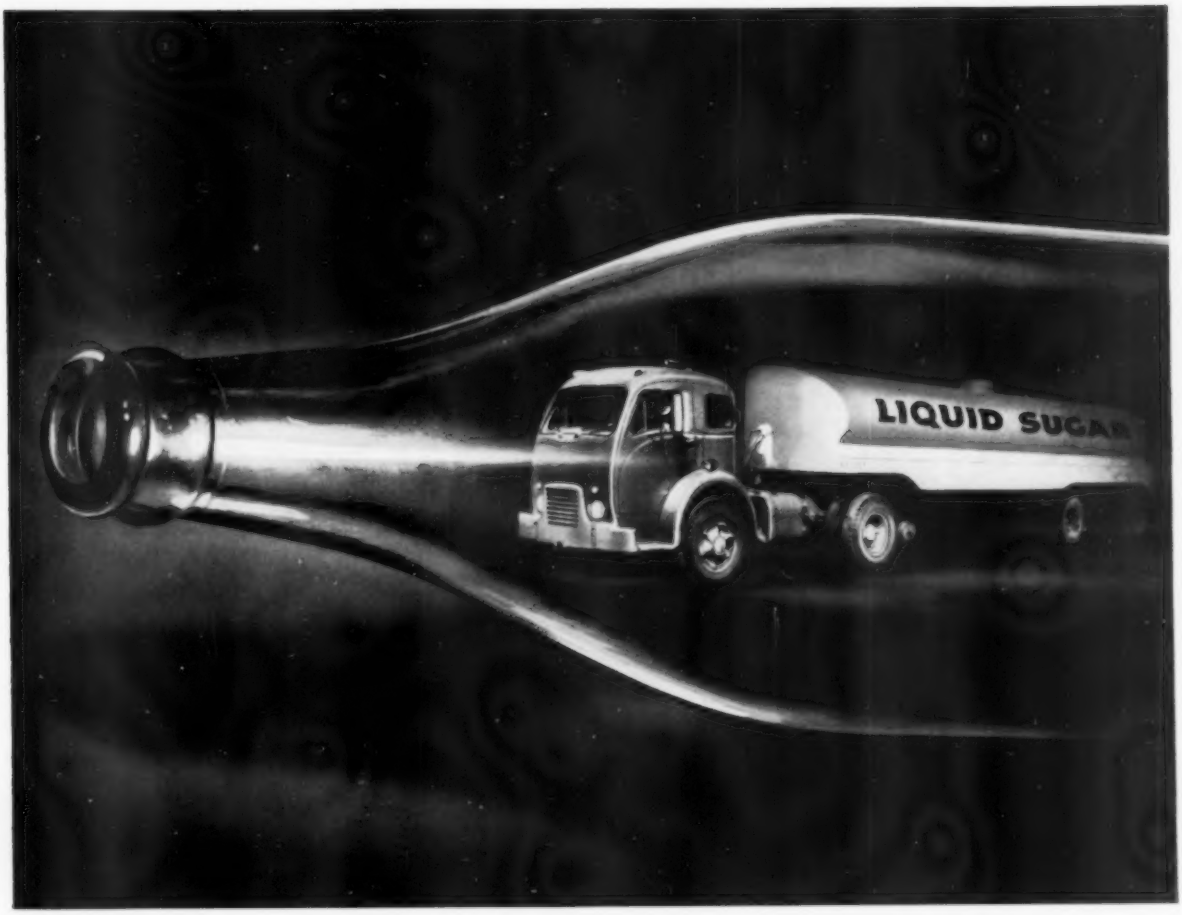
Karl M. Herstein, president of Herstein Laboratories, Inc. of New York, and well known to the sugar industry for his work on sucrochemistry in association with the Sugar Research Foundation, will be awarded the 1958 Honor Scroll by the New York Chapter of The American Institute of Chemists according to an announcement by Professor Ernest L. Becker, president of the Chapter. The award will be made at the annual dinner meeting in New York on June 4th. The honor is conferred on Mr. Herstein because of his long record of devoted service to the Institute, the American Chemical Society, and to the welfare of chemists in the United States. Mr. Herstein summarized his work with the Sugar Research Foundation in an address delivered to the Zerban Sugarmen's Association on March 13th.

The Hawaiian sugar industry received a shock recently when **George T. Davies,** president of Theo. H. Davies & Co., which is one of the five major sugar factors in the Islands, announced that he would vacate his post and live in New York. Mr. Davies only last year replaced John E. Russell upon his retirement. The 47-year-old Davies president is leaving the Islands because of his wife's ill health. Replacing Mr. Davies as president within the next few months will be **James H. Tabor,** who was recently named President of the Honolulu Iron Works.

J. Arthur Wood was named president and general manager of the Utah-Idaho Sugar Company at the annual meeting of the stockholders and Board of Directors held on April 21, 1958. Succeeding Mr. Wood, **David O. McKay** was named to head the board. The executive reorganization of the company included the retirement of **Douglas E. Scalley,** executive vice president and general manager since 1938.

Dr. B. I. Aldrich, left, Colonial Sugar Refining Co., Sydney, Australia, is shown discussing basic sugar research with Dr. L. F. Martin of the Southern Regional Research Laboratory, USDA, New Orleans, La., during one of the many visits he is making to sugar mills and sugar research organizations, en route back home from England where, for the past two years, he has been studying for his doctorate at Oxford University.

Nestor Sabi, manager of the cane sugar division of Dorr-Oliver Company, has been appointed division manager for international sales. **Joseph Sheehan** has been appointed manager of cane sugar division, international sales. Mr. Sheehan, a graduate of the National University of Ireland, formerly served as assistant chemist with the Irish Sugar Company.



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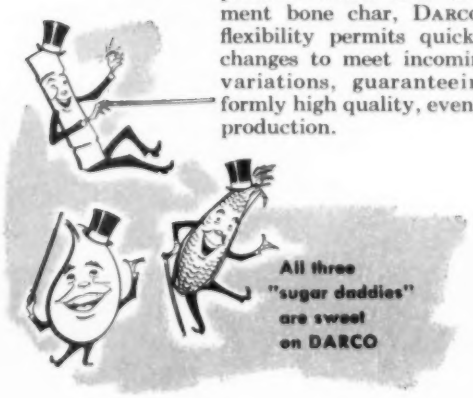

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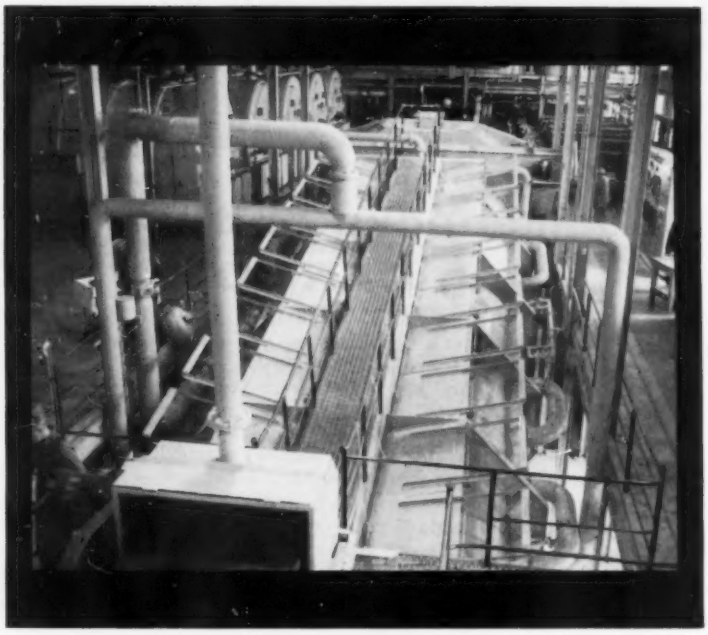

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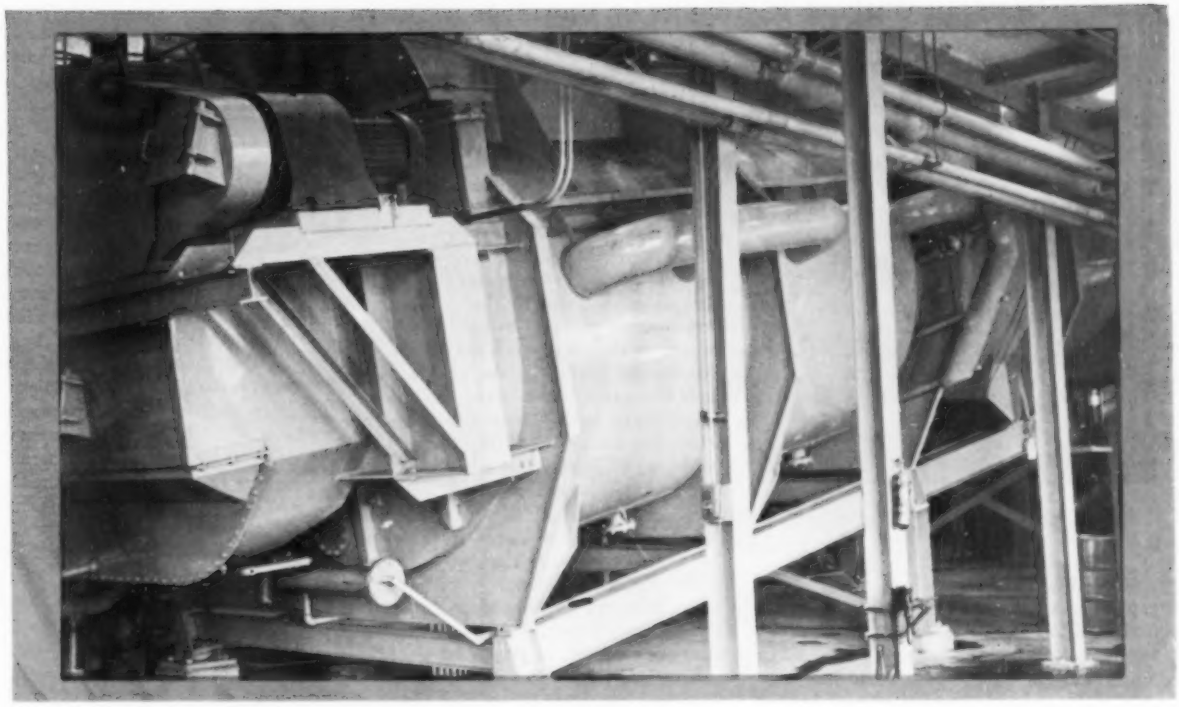

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Donald Maclean Outlines Highlights of Hawaiian Industry

Donald Maclean

The Hawaiian sugar industry was the subject of a talk by Donald Maclean, president, California and Hawaiian Sugar Refining Corp., at the luncheon meeting of the Sugar Club of New York on April 22. Not only the intrinsic interest of the subject itself but the critical conditions brought about by the strike in the Islands made the talk particularly appropriate.

Mr. Maclean sketched in briefly the highlights of the industry from its beginning at Koloa on the Island of Kauai in 1835 when a crop of 2.1 tons was produced until the present. Throughout its long history, labor has been a problem in the Hawaiian industry. Large numbers of Chinese, Japanese and Filipinos came to the Islands to work in the sugar industry. In addition, there was a substantial immigration from most of the European countries and the South Sea Islands. He touched on some of the important dates, as 1882 which saw the establishment of the Planter's Labor & Supply Company, forerunner of the present Hawaiian Sugar Planters Association, founding of the experiment station in 1895, starting of the C & H refinery in 1906, mechanical loading of cane in 1920, and mechanical harvesting in 1937.

The war years saw a marked reduction in the labor force, virtual freezing of wages and shortages of housing, appliances, and other supplies that caused pressures by the end of the war which resulted in what Mr. Maclean termed an "explosive interest in unionism by 1945." In that year came the first union contract and ". . . paternalism in the sugar industry had served its purpose and now was past." A strike followed in 1946 lasting just under three months.

The industry stabilized its labor situation and turned to intense mechanization, improvement in varieties, weed control, irrigation and fertilization. As a result of these improvements average production per acre of 96° sugar was 10.16 tons in 1957 with some plantations producing upward of 14 tons sugar per acre. An investment of $114 million was made in agricultural mechanization in the past 10 years.

Referring to C & H, Mr. Maclean explained that this organization is an agricultural marketing association, marketing as raws or refined the entire output of the 27 plantations and 1,300 independent planters. At the Aiea refinery, C & H produces 60,000 tons and at Crockett, approximately 750,000 tons of refined sugar. The balance moves east as raw sugar. The refined market is located in the 11 western states and the 11 west central states. In the last eight years sales in the west central states have averaged 265,000 tons. In the 11 western states C & H deliveries averaged 440,000 tons for the same period. During the seven years ending last year, average raw sales to Gulf and East Coast were 250,000 tons. Deliveries to Imperial in recent years simply substitute in that refinery for raws that would otherwise be purchased from sources of supply for North Hatteras refiners. It was, said Mr. Maclean, the intention of the Hawaiian industry to continue to ship a reasonable volume of raw sugar to Gulf and East Coast ports and not attempt to market all their sugar as refined in present marketing areas. In conclusion, he said:

"I am confident of the future—not only for Hawaii, but the industry as a whole. The population explosion the nation over, combined with a much better standard of living is a guarantee of a prosperous future—providing, of course, the industry does not make the mistake of other years and as a result, in the hopes of jumping the gun, expand capacity before demand has caught up."

■

Utilization of Bagasse

(*Continued from page* 33)

Finally, the processing cost of converting bagasse into the finished product must be determined. Development on a large pilot plant scale will be justified if reliable estimates of the supply and cost of raw material are economically favorable. Novel processes will require pilot plant investigation to determine optimum operating conditions, chemical, heat, power, labor, and other requirements, in the course of which data will be obtained for calculating manufacturing costs. Methods described in standard works on this subject [12] are applicable for making these calculations. The products now being made from bagasse in substantial volume all compete in existing markets with similar products made from other raw materials. Product quality is as important as the cost of the alternative raw materials. Sugarcane bagasse was selected from among a large number of suitable materials in the pioneer development of Celotex insulating board from an agricultural byproduct fiber.

Thorough economic analysis is not advocated to discourage wider use of a valuable byproduct, but to stimulate development of more profitable uses of the material. Less than 5% of over 15,000,000 tons of sugarcane fiber estimated to be produced in the Western Hemisphere is used industrially. Negligible quantities of some 10,000,000 tons available in Eastern Hemisphere areas are so used. Production of insulating board, paper, hardboard, plastics, and furfural that is being carried out successfully has been restricted largely, if not solely, for economic reasons. Limited markets accessible to many areas where the bagasse is produced obviously militate against production of more paper and board products until worldwide demand for such products increases. Markets can be created, as they have been for bag and wrapping paper made from bagasse at the Paramonga Factory of the Grace Company in Peru. It is hoped that the symposium may bring out new uses for the material in manufacturing some products for which accessible markets are in existence, or can be found. If the economic analysis shows that a proposed development is sound, unlimited efforts can be justified in commercializing rapidly any expanded use of the byproduct that will benefit the sugar industry.

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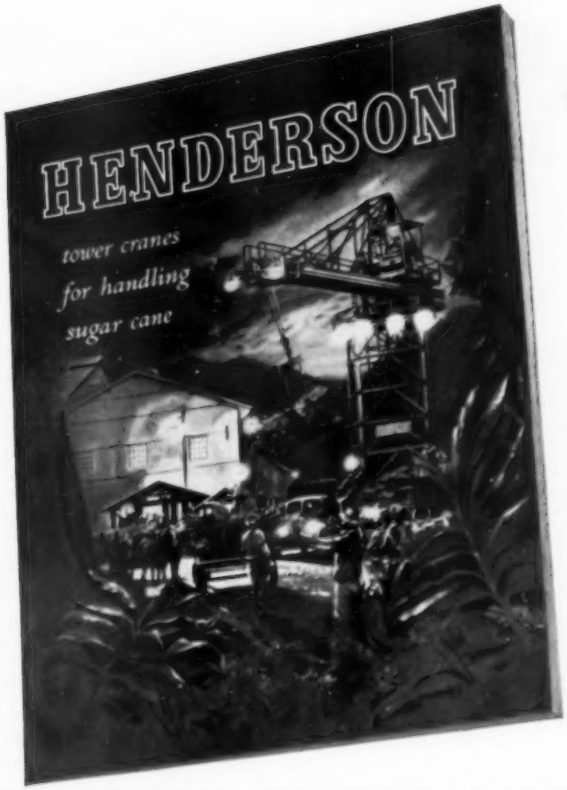
■

Courtney Tew

Courtney Tew, vicepresident and director of Savannah Sugar Refining Corporation, died on April 21. He was 66.

Born in Mount Pleasant, South Carolina, he began his employment with the Savannah Sugar Refinery in 1922. Somewhat later, he became associated with Lamborn & Company in Savannah but in 1930 returned to the Savannah Sugar Refinery. Mr. Tew was elected a director of the company in 1955.



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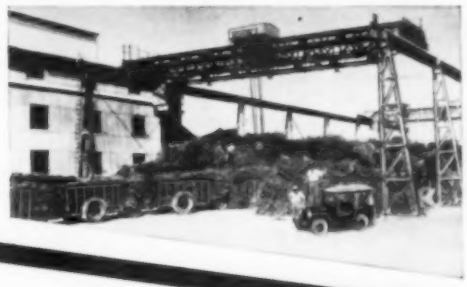

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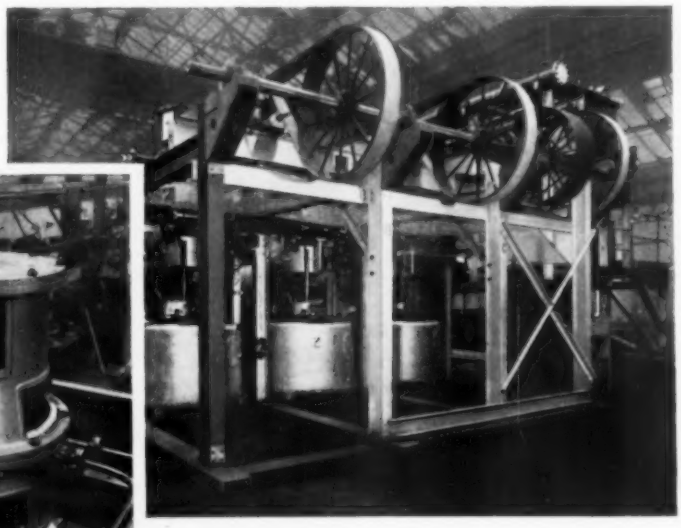

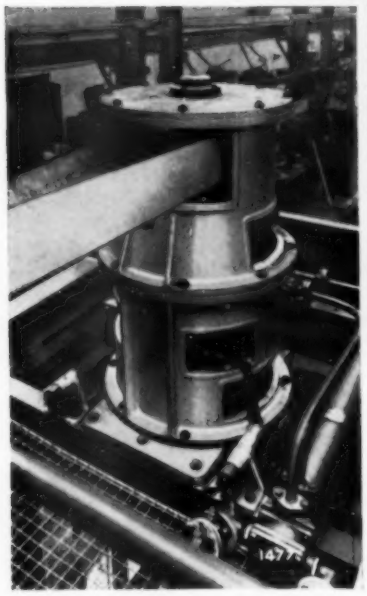

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SUGAR ABSTRACTS

Published under the Auspices of the International Society of Sugar Cane Technologists

by Special Arrangement with SUGAR y AZÚCAR — Dr. O. W. Willcox, Editor

Agriculture

Combatting Cane Stalk Borers with Insecticides in Java

J. RUINARD, *Mededelingen Java Suikerindustrie*, No. 5, p. 32 (1957).

The two most destructive stalk borers in Java are Proceras sacchariphagus (Bojer) and Chilotraea auricilia (Dudg.). Their life histories are similar to those of the Diatraea saccharalis common in other countries except that there is no pronounced seasonal periodicity as is the case in Louisiana. Heretofore, attempts to apply biological methods of control have been unsuccessful and the only remaining means is the use of insecticides. Application of insecticides by airplane is prohibitively expensive on areas less than 2500 acres, so the only recourse is hand labor. Use of common synthetic insecticides such as DDT, BHC, Toxaphene, Dieldrin and Endrin has given no consistent result. More effective are cryolite (6.7-13.4 lbs./acre) or ryania and rotenone (0.67-1.34 lbs./acre) applied by knapsack sprayers (in preference to dusting).

The field technique is based on the fact that the young borer larvae prefer the soft young joints in the top section of the stalk, and the best results have been attained by aiming the spray at the green foliage of the immature cane joints. Application is begun when the cane is three or four months old and is repeated at intervals of one or two weeks for three or four months, when the cane has become too tall for the work. Even under these limitations, the cane stalks are protected over two-thirds of their lengths and sucrose losses have been limited to 0.45-1.34 tons, depending on degree of infestation. Since one man can cover only 1¼ acres per day, the operation is necessarily restricted to the most heavily infested areas.

■

Factory Technology

Decolorizing Effects of Pittsburgh Granular Active Carbon in Sugar Refinining

JUNICHO SHIMIZU, *Proceedings* Research Society Japan Sugar Refineries' Technologists, Vol. 5, No. 12, pp. 34-43, 1956. (English summary).

Laboratory experiments were made to explore the possibility of replacing the active carbon used at this refinery with the granular active carbon manufactured by the Pittsburgh Coke and Chemical Company. The process then in use at this refinery was based on the carbonation process supplemented by treatment with a high grade active charcoal.

The liquor to be decolorized was passed through four towers of the Pittsburgh carbon at 70°±5°C. The carbon was mixed beforehand with burnt magnesite in the proportion of 5% by weight of the carbon. Brown liquors of Lovibond color 4.4°-14° were decolorized to 0.27°-1.2°. Virtually no change was observed in the specific conductivities of the original and the treated liquors, and there was virtually no change in the inorganic compositions of the liquors. A contact time of 1.5 to 2 hours was necessary for good decolorization at 60°-70°C. According to calculations, the cost of purification of the liquor by the combination of carbonation plus Pittsburgh ion-exchanging carbon amounts to U.S. $111 per 100 tons of melt. By use of the Pittsburgh carbon alone the cost is U.S. $142, and in the case of the ordinary bone char process, it is U.S. $160.

■

Experiments on the Standard Sulfitation Process of Cane Juice Clarification

J. M. SAHA and D. L. N. RAO, *Proceedings of the Sugar Technologists' Association of India*, Vol. 25, Part I, pp. 185-194 (1957).

Along with their work on the "New Technique" method of juice clarification Saha and Rao have done new work on the standard or "straight" sulfitation process. Here they have arrived at the following conclusions:

Addition of triple superphosphate (TSP) to the raw juice gives lower CaO content in the final juice; these additions of TSP may be made to the extent of 0.015% on cane when natural P_2O_5 in cane in northern India is below 300 mg. per liter of juice; even if the P_2O_5 content is above 300 mg., it is desirable to add up to 0.01% on cane because such additions, combined with heating the neutral juice at a lower temperature yields very light-colored juice and an excellent quality of sugar. It makes no difference if the TSP is added in the form of a slurry or as a settled solution.

The maximum rise in purity from raw juice to clear juice is obtained when the neutral juice is heated to 200° F. before settling. Heating to 190° F. or to 210° F. makes a little difference so far as concerns the CaO content of clear juice, but the juice from the 190° F. operation is lighter in color. Heating to 200° F. is, therefore, considered to be adequate. Even heating at 190°-195° F. at the latter part of the season, when reducing sugars are high, has been found to be adequate in factory practice.

Pre-sulfitation or simultaneous liming and sulfitation of the raw juice yields final juices with almost equal purities and CaO contents, although the color of the juice obtained from pre-sulfitation is lighter.

Increased additions of lime to the juices gives a slightly lower CaO content and lower color, but 1.25% of 12° Be. milk of lime is considered economic and adequate.

Although increased addition of superphosphate gives higher purities and better color removal, the decrease of rise in purity is not such as to justify the increased cost.

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Centrifuging of Mixed Juice

Report of Sugar Milling Research Institute, South African Sugar Year Book, p. 123 (1956-57).

The unsatisfactory filterability of South African raw sugars is mainly due to starch, wax and silica which exist in the mixed juice in the form of finely divided suspended matter. An investigation was started to see whether these impurities could be removed by a high-speed Alfa-Laval centrifugal. This machine reduced the content of starch in the mixed juice to 50 ppm.; the discharged mud contained 10,000 ppm. of starch. However, erosion of certain parts of the centrifugal occurred, due to sand present in the juice, and it remains to be seen if installation of a continuous sand filter in front of the centrifugal will overcome this difficulty.

■

Effect of Versene on Sugar Complexes; Possibility of Increasing Exhaustibility of Molasses

S. N. GUNDU RAO, R. A. RAMAIAH, and S. K. D. AGRAWAL, *Proceedings of the Sugar Technologists' Association of India*, Vol. 25, Part I, pp. 127-128 (1957).

Versene (ethylenediaminetetra-acetic acid) has an important property of forming stable, soluble complexes with calcium, magnesium, iron and lead. For this reason, versene has come into use in the analysis of sugar solutions to eliminate the so-called lead error. It breaks up the complex compounds between sugar and lead, chelates (occludes) the lead in a soluble form, and sets free the combined sugars which then increase the Pol reading.

The extent of this increase of Pol was determined in a test of molasses from 12 factories. The purity of these samples was tested by both the wet and the dry methods; the clarified solutions were treated with versene and Pol was again determined. It turned out that the purities of the molasses, though different for different samples, were increased by 6.6 to 14.3 units (average 10).

An interesting suggestion is made that if versene were added to the sugar in the vacuum pan, the amount of sugar that is released and becomes available for crystallization would be considerable, and the exhaustibility of molasses would be correspondingly increased.

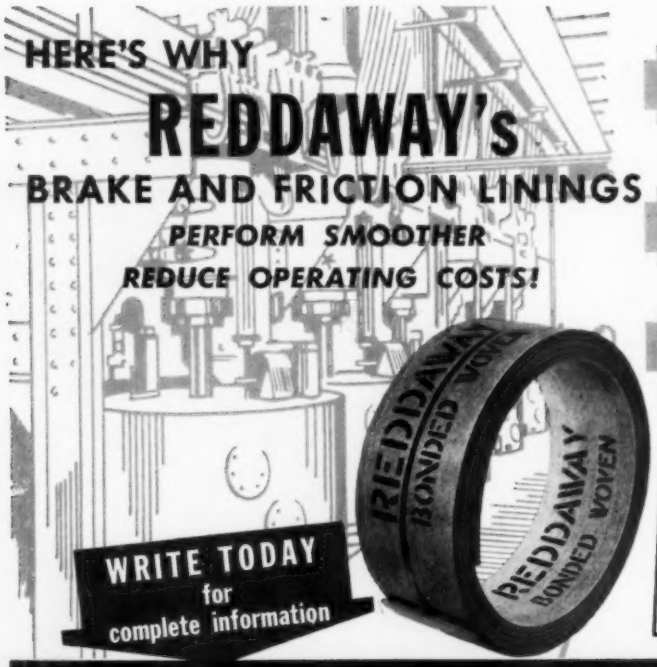
■

Use of Versene to Increase the Exhaustibility of Molasses

J. M. SAHA, D. L. N. RAO, AND VIRENDRA SINGH, *Indian Sugar*, Vol. 7, No. 10, pp. 645-650 (1958).

In a recent paper, Gundu Rao and collaborators reported an attempt to increase the exhaustibility of molasses by treating it with the organic chelating compound versene. They have given analytical figures tending to show that by their versene treatment it is possible to increase the apparent purity of the molasses by as much as 10.5 units. In view of the obvious importance of such a result, the matter was re-examined at the Birla Sugar Research Laboratory.

The research at Birla failed to disclose any evidence that molasses contains "complexes" of sugars, particularly sucrose and fructose, and therefore the question of breaking up these



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hypothetical complexes with versene so as to release more crystallizable sucrose does not seem to arise. The Birla researchers found no evidence that versene releases any sucrose or any other sugar; there is, therefore, no increase in purity; that the addition of versene does not increase polarization or gravity purity, and therefore no occasion exists for changing the present methods of sugar analysis involving the measurement of polarization.

Even if the claim of higher exhaustion of molasses and additional recovery of sugar with the help of versene were valid, the cost factor will probably preclude the use of versene at its present price and the indicated rate of consumption (a 1000-ton cane factory producing 36 tons of Brix in molasses a day would require 3.6 tons of versene per day).

■

Rapid Method for Bacterial Counts in the Sugar Industry

WILLY BARTELMUS and FRIEDRICH PERSCHAK, ZEITSCHRIFT ZUCKERINDUSTRIE 1957, pp. 276-281.

In recent years sugar technologists have been much concerned about the activities of micro-organisms in sugar factory liquids, and which are held accountable for undetermined losses of sucrose in the manufacturing process. Numerous methods for making bacterial counts have been proposed and used, but even the best of them require much time for incubating the experimental cultures.

In a method developed in an Austrian sugar factory, use is made of a culture medium which requires no more than ten hours for incubation; its composition (in grams) is:

Peptone Trypt digested
Meat extract
Yeast extract
Potassium diphosphate
Magnesium sulphate
Iron sulphate
Sucrose
Agar-agar
Tap water
p-H about 7.2

In application of the method, 0.1 ml. of the liquid to be investigated is placed on the scaled area of a sterilized microscope slide; then is added 4 to 6 drops of the culture medium, previously warmed to 50-70°C. on a water bath; the two liquids are then uniformly mixed with a platinum wire bent at right angles; the slide is put under a bell jar and after hardening is transferred to the moist chamber for incubation and counting in the usual manner.

■

Mechanical Depithing of Sugarcane Bagasse

ARTHUR G. KELLER, *Sugar Journal*, Vol. 20, No. 7, pp. 23-24; 26-27; 29; 30; 32; 36 (1957).

A new machine and a process for depithing bagasse for use in the manufacture of paper pulp has been developed and is now operating on a pilot plant scale at the Louisiana State University. This plant consists of a specially designed hammer mill in which bagasse from the grinding mill is subjected to a beating and combing action, whereby about 20% of the dirt and pith are removed; the material then passes into a second unit which is operated with water to soften and open up the fiber bundles. In this second unit an additional 5% of impurities is removed and the rest of the bagasse passes out as a clean fiber, free from soluble matter. Detailed cost estimates of operating such a commercial depithing plant under Louisiana conditions give $0.60 per ton of "bone dry" depithed fiber. Taking account of all factors, including the fuel value ($2.90 per ton of bone dry fiber), baling, stacking, de-stacking and loading, maintenance, depreciation, interest, insurance, and freight charges, the total cost of bone dry bagasse laid down at the paper mill comes to $10.71 per ton. Investment cost of a depithing plant to handle 25,000 tons of fiber in a season is $12,000. It is figured that where a ton of bleached pine pulp is paid for at $37.40 per ton, a ton of depithed bagasse should sell for $17.35, which would give the depithed bagasse a cost advantage of $20.05. Of course bagasse is not suitable for as many different grades of paper as pine pulp, but within its range of usefulness bagasse pulp will merit due consideration by the paper industry.

The high proportion (35%) of the cost of bagasse due to handling and storage indicates the need for further study and the development of less expensive techniques for these operations.

■

Use of a Wetting Agent for Recovery of Sucrose from Bagasse

I. HENG CHEN, *Taiwan Sugar*, No. 8, pp. 13-17 (1957).

In a series of tests over a period of 25 days it was indicated that adding 30 ppm of alkyl-aryl sulfonate to the maceration water can reduce the average Pol of sugar cane bagasse by 0.25%. The test was made in a factory grinding 1500 tons of cane per 24 hours. For success of this operation, the rates of grinding and application of maceration water must be kept constant, and the cane must not be coarsely shredded. The result of the test showed an economic advantage.

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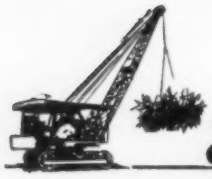

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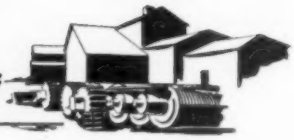

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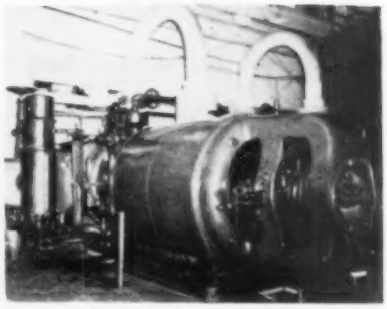

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National Committee on Sugar Analysis Meets

In preparation for the June meeting of the International Commission for Uniform Methods of Sugar Analysis in Washington, the United States National Committee met in San Francisco on April 17 and 18. Thirty-seven members and industry representatives attended. Recommendations on analytical methods under 28 subject headings were considered. T. R. Gillette, California & Hawaiian Sugar Refining, was acting chairman. R. A. McGinnis of Spreckels was elected chairman to be seated following the Washington meeting. P. F. Meades of C & H was elected vice-chairman; J. L. Hickson of Sugar Research Foundation, secretary-treasurer. New members of the executive committee are George P. Meade, W. W. Binkley of New York Sugar Trade Laboratory, E. J. Culp of American Sugar Refining and T. R. Gillette.

■

Etched Screens Provide Advantages

Etched screens for filtering, centrifuging, straining or classification are now available to the sugar industry and permit more flexibility than has been possible with the conventional perforated screens. Basically, etching rather than punching the perforations makes it possible to provide considerably more open space for the same area without warping or weakening the metal. Where an 00 sugar screen conventionally provides 26% open area, as much as 60% open area can be provided when the plate is etched. Plates can be etched for any type of perforation, round, square, slotted, straight sided or conical. Perforations may be etched in thicker plates than has been possible with punched perforations, eliminating the need for a back-up plate in a centrifugal screen. Announcement of the new process for etching screens is made by the Pyramid Screen Company, 30 Church St., New York, N. Y.

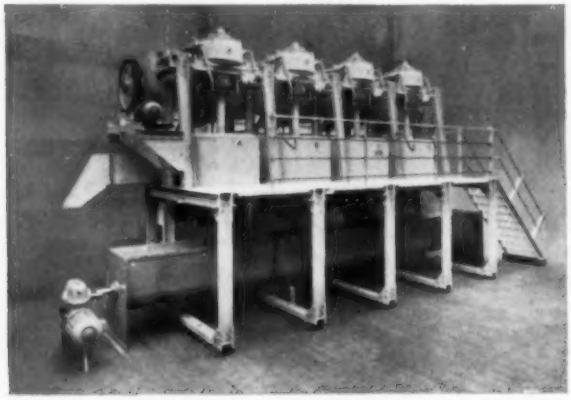
■

Dyer Memorial Award Established

An award has been established to recognize yearly a man connected with the U. S. sugar economy who has made an outstanding contribution to the industry. The award program, established by B. W. Dyer and Company, sugar economists and brokers, commemorates the firm's founder, B. W. Dyer, Sr. who died in 1953 after serving the sugar industry for 50 years.

Three honorary judges will be named by Dyer & Company to serve staggered three-year terms. They will select each year an individual who has made a significant contribution to the United States sugar trade. Such an individual may be of any nationality that is directly concerned with the U. S. sugar economy, but excludes members of the firm and government employees, who are already public servants. The award is a large sterling silver trophy on which the winner's name will be permanently engraved. The winner keeps the large trophy for a year and it is then passed on to the next winner; each winner, however, receives a miniature engraved trophy for his permanent possession.

General Partners of B. W. Dyer & Company, left to right: Daniel L. Dyer, Leonard F. Daidone and Benjamin W. Dyer, Jr., who recently set up a memorial award for sugar trade in memory of the firm's founder, whose portrait appears behind the Partners.



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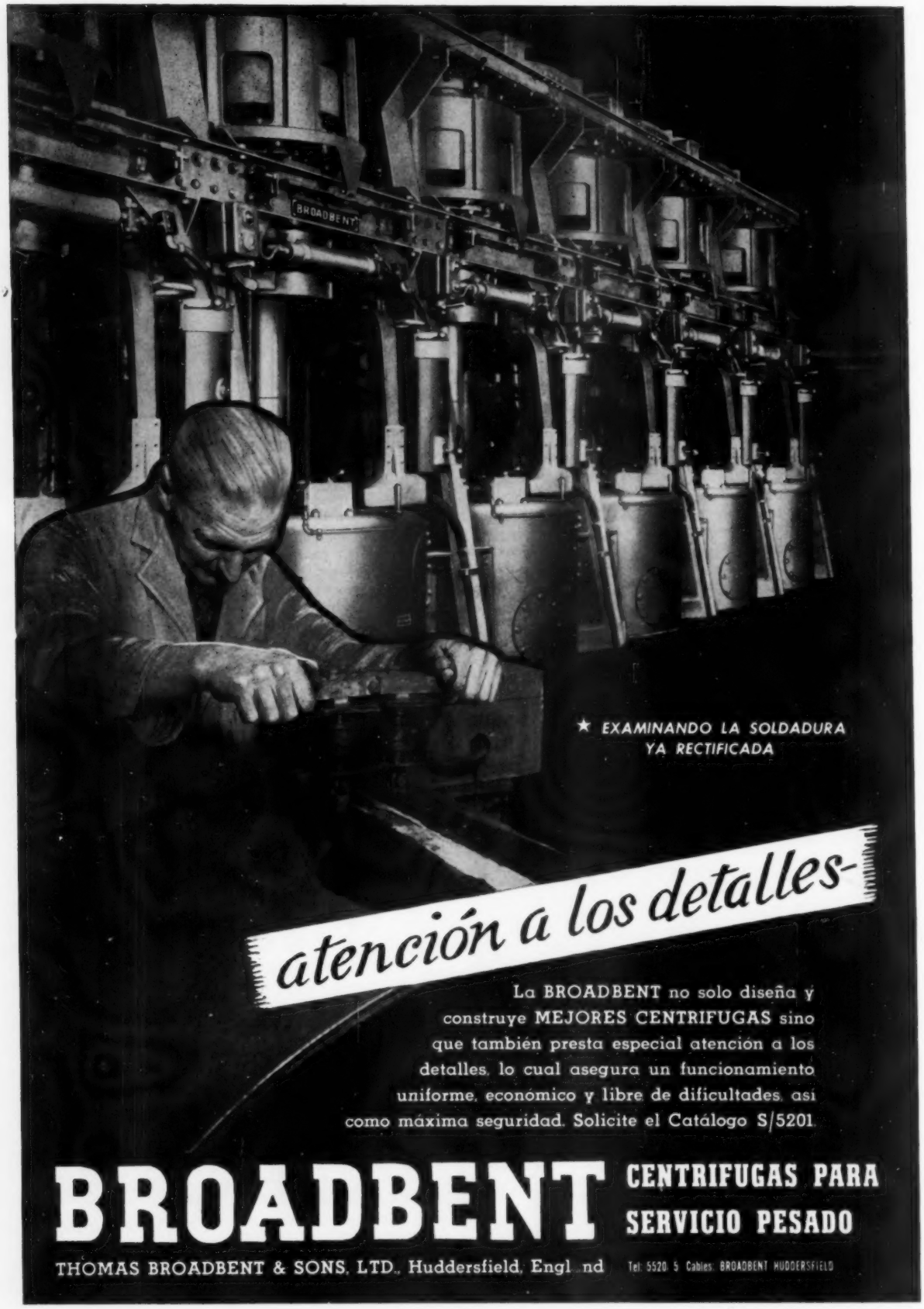
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AZÚCAR

Junio 1958

Reduce las Pérdidas de Sacrosa

Nuevo Bactericida Inactiva la Invertasa

Por Dr. John W. Appling

Investigador Microbiológico en Jefe, Food Section, Buckman Laboratories

Un nuevo y más completo aproche para reducir las pérdidas de la sucrosa ha sido descubierto. Este aproche es basado en el uso de una bactericida nueva que es añadido a los primeros dos o tres molinos en cada tándem y previene el limo en todas partes del equipo del ingenio azucarero que está en contacto con el guarapo así tratado, desde el momento en que se extrae hasta cuando llega a los clarificadores. Como algunos de los microorganismos contenidos en el limo constituyen la fuente mayor de la invertasa, una buena prevención del limo virtualmente elimina esta fuente de la enzima destructora de la sucrosa. Además, el mismo bactericida inactiva a la invertasa. Ni el bagazo ni otro material orgánico presente en el guarapo afectan la actividad del bactericida, y ni el azúcar ni la primera melaza hechas de guarapo conteniendo 10, 20, y 40 p.p.m. del bactericida, contienen residuos perceptibles de la misma.

El guarapo normal parece ser casi un medio ideal para el desarrollo de una gran variedad de microorganismos. Contiene aproximadamente 14 por ciento de sucrosa, cantidades adecuadas de compuestos nitrogenados y un número de factores de desarrollo. Tiene un pH y temperatura favorable cuando ha sido recientemente extraído de la caña. Bajo las condiciones reinantes en la mayoría de los ingenios azucareros, el desarrollo de algunos microorganismos empieza casi inmediatamente después de que el guarapo ha sido extraído. Un efecto de este desarrollo es el de reducir la cantidad de la sucrosa en el guarapo. En relación con las pérdidas de la sucrosa, Owen (2) dice: Bajo condiciones ordinarias, se asume generalmente que en el tiempo ocurrido entre la extracción del guarapo y el transferimiento a los clarificadores, no ocurre pérdida perceptible de la sucrosa; sin embargo, hay fuerte evidencia de que esto no se aplica a las aperaciones de molienda, donde el molino no es mantenido en buenas condiciones sanitarias. Por ejemplo, Orth observó que bajo condiciones desfavorables, resultadas de operaciones de molinos sucios, la pérdida de la sucrosa era más rápida. Por otra parte, cuando la limpieza era mantenida, el guarapo tomado del último molino podía ser guardado por cinco horas con poco signo de deterioración.

Se sabe que ciertas especies de bacterias secretan la enzima invertasa y que pequeñas concentraciones de esta enzima, rápidamente invierten la sucrosa en glucosa y fructosa. En adición a la invertasa secretada por los microorganismos, puede haber también en algunas ocasiones cantidades significativas de la invertasa en el guarapo cuando éste es extraído de la caña. El aumento de limos en el equipo del ingenio que está en contacto continuo con el guarapo, constituye la fuente más importante de la invertasa. La limpieza frecuente y cabal del limo en el equipo de molienda ayuda a reducir las pérdidas de la sucrosa. Sin embargo, el rápido desarrollo de los microorganismos en el guarapo, que es tan altamente nutritivo, hace impracticable la eliminación de la acreción de limo y las pérdidas consecuentes de la sucrosa, debido a la inversión de la enzima.

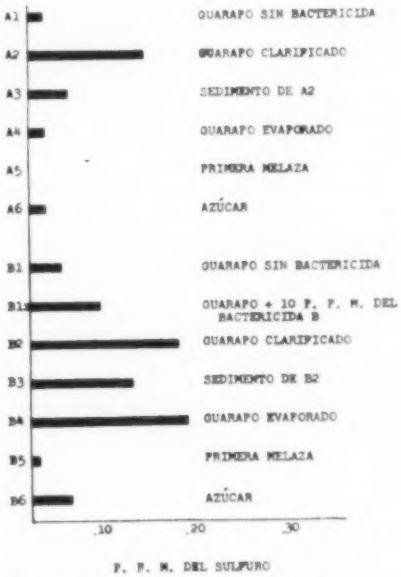

Fig. 2. Contenido del sulfuro en las muestras tomadas de los experimentos A y B en la Audubon Sugar Factory, Del 21 al 30 de octubre de 1957.

Un aproche para reducir las pérdidas de la sucrosa en el guarapo recientemente extraído es el añadir continuamente cloro, o compuestos que liberan cloro, tales como los hipocloritos y la cloramina. Como el cloro reacciona rápidamente con todas las clases de materiales orgánicos en el guarapo y con el mismo bagazo, tales tratamientos son necesariamente limitados a cortos períodos de contacto entre el guarapo y el cloro. En adición a la acción corrosiva del cloro en forma gaseosa y el cloro de los hipocloritos, hay también una prevención inadecuada de la acreción de limo en las superficies que no se ponen en contacto con el cloro. Como se señaló anteriormente, la acreción de limo sober los equipos constituye la fuente más importante de la invertasa y a menos que tal acreción sea eliminada, continuará a producir invertasa en esas partes del sistema del ingenio que no es tratada con el cloro o con compuestos que liberan cloro. Aún cuando no hay duda alguna de que la invertasa es la causa directa de la inversión, una manera más efectiva para prevenir esta inversión debe ser la de eliminar la fuente más importante de la invertasa, a saber, los microorganismos en la acreción sobre los equipos.

Si, en adición a evitar la acreción de limo sobre el equipo del ingenio, un tratamiento también inactivaría toda o la mayor parte de la invertasa que todavía permanece en el guarapo, esto ciertamente sería un nuevo y más completo aproche para reducir las pérdidas de la sucrosa en el guarapo. El que esto escribe, ahora presentará la evidencia experimental que indica que tal tratamiento efectivo es posible.

Este esperimento consistió en observar el efecto de añadir continuamente un nuevo bactericida A[1] de azufre orgánico por una

[1] **El bactericida A tiene la siguiente composición:**

Ingredientes activos	
Cianoditioimidocarbonato disódico	**20.0%**
Etilenodiamina	**7.5%**
Ingredientes inertes	**72.5%**

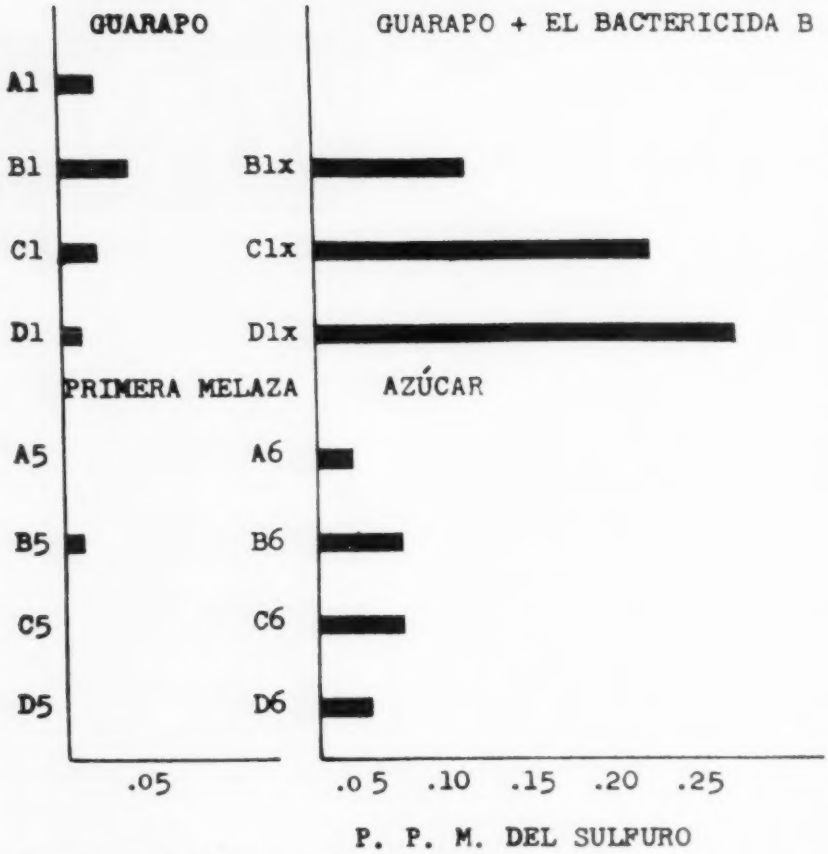

Fig. 1. Contenido del sulfuro en las muestras tomadas de cuatro experimentos en la Audubon Sugar Factory. Del 21 al 30 de octubre de 1957. Clave: A = sin bactericida; B = 10 p.p.m. del bactericida B; C = 20 p.p.m. del bactericida B; D = 40 p.p.m. del bactericida B.

semana a el guarapo diluído alimentado a la caña molida que entra a los molinos No. 1 y No. 2 sobre uno de los tándems de este ingenio. La cantidad del bactericida añadido fué 10 p.p.m. de partes del guarapo diluído saliendo del tándem. Antes de empezar este experimento, se notó que el plato para la distribución del guarapo arriba del molino No. 1 estaba cubierto con una capa perceptible de limo castaño y que el plato correspondiente arriba del molino No. 2 estaba igualmente cubierto con una cantidad menor de limo. En la mañana del primer día del experimento se limpió mecánicamente aproximadamente la mitad del plato de distribución arriba del molino No. 1 para remover todo el limo visible, y el resto del plato fué dejado cubierto con el limo. Observaciones fueron hechas durante un período de 10 días por acreción de limo sobre los platos de distribución. La parte del plato que había sido limpiada mecánicamente mostró no acreción hasta el tercer día después de que el tratamiento había sido descontinuado. La porción del plato que estaba cubierta de limo, gradualmente se puso tan limpia como la otra porción en dos días, y permaneció limpia hasta el tercer día después que el tratamiento había sido descontinuado. Al presente una pequeña pero perceptible acreción de limo estaba presente. Esto indicó que había habido un efecto restante del tratamiento con el bactericida, que duró casi tres días después que el tratamiento había sido descontinuado.

Basado sobre más de 10 años de prevención satisfactoria de limo en los sistemas de las fábricas de hacer papel en los Estados Unidos y en Canadá, el que esto escribe está seguro que la ausencia continua de la acreción de limo en las porciones del equipo que previamente estaban cubiertas de limo, significa una buena prevención del limo por el bactericida empleado. Por lo tanto, aplicando este mismo criterio a las observaciones hechas en este ingenio azucarero, el que esto escribe cree que la prevención del limo fué llevada a cabo por lo menos en los dos molinos tratados con el bactericida A y probablemente dondequiera que este guarapo así tratado estaba en contacto con el equipo del ingenio, cuando estaba en camino a los clarificadores. La ausencia visible de limo significa la ausencia de millares de microorganismos que producen este limo, incluyendo a esas especies que secretan la invertasa. En este experimento relativamente corto no se atentó el determinar la cantidad de reducción en las pérdidas de la sucrosa. Sin embargo, una reducción en la pérdida de la sucrosa sería un resultado inevitable sin cuidado de que esto pudiese ser establecido estadísticamente e el frente de tantos variables envueltos en la operación del ingenio azucarero.

El que esto escribe he hecho un mímero de experimentos de laboratorio para medir el efecto de la invertasa sola e invertasa con pequeñas cantidades de bactericidas de azufre orgánico sobre la inversión de la sucrosa pura y el azúcar de caña, refinada. Cantidades disminuyentes de la invertasa purificada fueron empleadas hasta que la cantidad de la invertasa había causado 1.9% de pérdida en la sucrosa en un período de 30 minutos y cerca de 9.0% de pérdida en 60 minutos. En este experimento en particular, cuatro porciones iguales de una solución de sucrosa normal de 0.4, conteniendo respectivamente no bactericida, 10 p.p.m. del bactericida A, cinco partes por millón del bactericida B[2], y 10 p.p.m. del bactericida B. Cada porción contenía 1 miligramo de invertasa purificada en 100 mililitros de la solución de sucrosa. Se tomaron indicaciones con un polarímetro después de 15, 30 y 60 minutos a aproximadamente 27° C. El experimento fué repetido otra vez. Los contenidos de sucrosa fueron determinados por el Herzfield-Schrefeld Modification of Clerget's Method (3). Las pérdidas de sucrosa en por ciento son dadas en la Tabla 1.

Estos datos muestran que 10 p.p.m. de cualquiera de los dos bactericidas A o B resúltaron en esencialmente completa inactivación de la invertasa en por lo menos 30 minutos. Es de sumo interés el notar que aun cinco partes por millón del bactericida B causó reducciones significativas en la pérdida de la sucrosa durante el período inicial de 30 minutos.

El bactericida B ha ya demostrado superioridad sobre el bactericida A en la prevención de microorganismos en las sistemas de las fábricas de hacer papel y en otras partes. Creemos por lo tanto, que esta experiencia en las fábricas de hacer papel junta con la habilidad del bactericida B para inactivar la invertasa, indican un nuevo y más completo aproche para la reducción de las pérdidas de la sucrosa en el guarapo. No solamente tenemos un bactericida que impide la acreción de limo y de esta manera disminuye la producción de invertasa por los microorganismos que estaban en el limo, pero también tenemos un bactericida que inactiva a la invertasa

[2] **El bactericida B tiene la siguiente composición:**

Ingredientes activos	
Cianoditioimidocarbonato disódico	**13.3%**
Etilenodiamina	**4.7%**
N-metilditiocarbamato de potasio	**18.0%**
Ingredientes inertes	**64.0%**

por períodos de tiempo adecuados desde el punto de vista de las prácticas en el ingenio azucarero.

Además, esta clase de bactericida no es afectado por la presencia de bagazo y otros materiales orgánicos en el guarapo. Este hecho permite la introducción de la solución bactericida al frente de los molinos que reciben el guarapo diluído de los molinos al final del tándem. En esta manera, el guarapo diluído conteniendo el bactericida se pone en contacto con todas las partes de estos molinos lo mismo que las artesas y cañerías que llevan el guarapo a los clarificadores. Porciones de los molinos que son de otra manera inaccesibles son continuamente tratadas y la acreción es removida e impedida de volver a aparecer.

Finalmente, tomaremos el asunto de que si se puede o no encontrar algún residuo de este bactericida en cualquiera de los productos finales, el azúcar o la melaza, cuando el bactericida ha sido empleado en las cantidades recomendadas. Se sabe que los compuestos de azufre orgánicos contenidos en estos bactericidas sufren cambios cuando soluciones diluídas de estos están sujetas al calentamiento prolongado del guarapo durante clarificación y evaporación. Sin embargo, a fin de obtener evidencia directa de la ausencia de estos bactericidas en el azúcar o la melaza, cinco experimentos fueron hechos durante el mes de octubre del año 1957 en la instalación piloto de la Audubon Sugar Factory en la Louisiana State University para determinar si había algún residuo perceptible presente en el producto final cuando cantidades conocidas del bactericida B habían sido añadidas al guarapo.

Arreglos fueron hechos con el Dr. Philip W. West para colectar siete nuestras de cada experimento y analizarlas empleando métodos seleccionados y modificados por él mismo. Dos clases de análisis químicos fueron hechos para cada muestra: uno para sulfuro con un método TAPPI modificado (4) y otro para cianuro y tiocianato por una modificación del método Aldrich (1). Ambos métodos están incluídos en el apéndice. Cada método tiene suficiente sensitividad para hallar una concentración de solamente una parte por millón.

Las siete muestras colectadas durante cada experimento consistieron de guarapo, guarapo con una cantidad del bactericida B, guarapo clarificado, sedimento del guarapo clarificado, guarapo evaporado, azúcar, y primera melaza. Análisis químicos fueron hechos en cada una de las primeras cuatro muestras, inmediatamente después de haber sido colectadas, y en cada una de las otras tres muestras dentro de 12 horas con solamente una excepción, y el experimento fué repetido y los resultados fueron confirmados con análisis subsecuentes.

En el experimento A, una hornada de guarapo sin bactericida B fué preparada, y se sacaron nuestras para determinar las cantidades de sulfuro, cianuro y tiocianato

Tabla I. Reducción de las Pérdidas de la Sucrosa por Inactivación de la Invertasa por Medio de los Bactericidas A y B.

No.	Bactericidade p.p.m.	Por ciento de pérdida la sucrosa después de 15 min.	30 min.	60 min.
1	ninguno	1.3	3.1	9.1
1A	ninguno	0.2	0.6	8.8
Promedio		0.8	1.9	9.0
2	5 de B	0.2	1.4	4.9
2A	5 de B	0.0	1.8	6.6
Promedio		0.1	1.6	5.8
3	10 de B	0.0	0.0	6.0
3A	10 de B	0.0	0.2	2.5
Promedio		0.0	0.1	4.3
4	10 de A	0.0	0.0	0.1
4A	10 de A	0.0	0.0	0.0
Promedio		0.0	0.0	0.1

normalmente presentes en el guarapo. Aunque no esperabamos encontrar cianuro y tiocianato, fué de mucha sorpresa el encontrar cantidades medibles de sulfuro en todas las muestras a excepción de la primera melaza (véase la Figura 1). A fin de determinar si el sulfuro estaba normalmente presente en la producción comercial, obtenimos muestras de azúcar y primera melaza de cada uno de dos ingenios azucareros por allí cerca. Estos también contenían cantidades medibles de sulfuro que eran comparables a esas encontradas en el azúcar y primera melaza de la instalación piloto. Otra vez la ausencia del cianuro y tiocianato fué confirmada.

Experimentos B, C y D fueron hechos en la instalación piloto con hornadas de guarapo a las que se le habían añadido 10, 20 y 40 p.p.m. del bactericida B. Estas hornadas fueron preparadas y muestras de ellas fueron tomadas como se indicó anteriormente. El contenido de sulfuro en el guarapo con el bactericida añadido, inmediatamente dió el esperado incremento de sulfuro como comparado con el guarapo sin nada (véase la Figura 2). El contenido de sulfuro otra vez aumentó en el guarapo clarificado y en el sedimento como comparado con los valores obtenidos en el primer experimento. Entonces el contenido de sulfuro disminuyó bruscamente en el guarapo evaporado, el azúcar, y la primera melaza. Se concluyó que no existía diferencia significativa en el contenido de sulfuro entre todas las muestras de azúcar y primera melaza que habían sido analizadas si producidas del guarapo que se le había añadido el bactericida B o si producidas del guarapo sin tratamiento. En ningún caso el cianuro y tiocianato estaban presentes. Cuando se recuerda que estos métodos analíticos eran suficientemente sensitivos y exactos para hallar una parte por millón, podemos concluir que el bactericida B no estaba presente en el azúcar o en la melaza.

Para sumarizar, un nuevo y más completo aproche para reducir las pérdidas de la sucrosa en los ingenios azucareros es disponible por el uso de un nuevo bactericida orgánico B. Este bactericida actúa impidiendo la acreción de limo en los molinos, altezas y otro equipo en contacto con el guarapo cuando fluye de los trapiches a los clarificadores. Como resultado directo de impedir la acreción de limo, la fuente mayor de la invertasa es removida; de cualquier modo, el bactericida B también inactiva cantidades significativas de la invertasa durante el período de tiempo normalmente requirido por el guarapo extraído a ser transferido a los clarificadores. Finalmente, se ha establecido que el bactericida B deja no residuo perceptible en el azúcar o la primera melaza.

Reconocimiento

El escritor agradecidamente reconoce la ayuda de los Ingenieros Edward Jimenez Garriga e Ignacio Warner de Fosfonitro, S. A., Habana, Cuba. El primero ayudó al escritor durante los experimentos en el ingenio cubano y el último durante los experimentos en la Audubon Sugar Factory.

Este artículo fué escrito en español por el autor.—Redactor.

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■

Maclean Presenta Un Bosquejo de la Industria Azucarera de Hawaii

Este fue el tema del Sr. Donald Maclean, presidente de la California & Hawaiian Sugar Refining Corp., tratado en su discurso durante la reunión y almuerzo celebrados en el Club Azucarero de Nueva York el 22 de abril. Su charla fue especialmente propicia, tanto por el vivo interés en el tema como por la difícil situación creada por la huelga en el Territorio de Hawaii.

El Sr. Maclean hizo una breve reseña de la industria azucarera de Hawaii desde su principio en Koloa, Isla de Kauai, en 1835, con una producción de 2.1 toneladas. Durante toda su historia, los productores de azúcar en Hawaii vienen luchando con el problema de la fuerza de brazos. Gran número de chinos, japoneses y filipinos emigraron a Hawaii para trabajar en la industria azucarera, a los que se agregaron buen número de emigrantes de países europeos e islas del Mar del Sur. Mencionó varias épocas importantes, como el año de 1882 cuando se estableció la Planters' Labor & Supply Company, precursora de la actual Hawaiian Sugar Planters' Association; la

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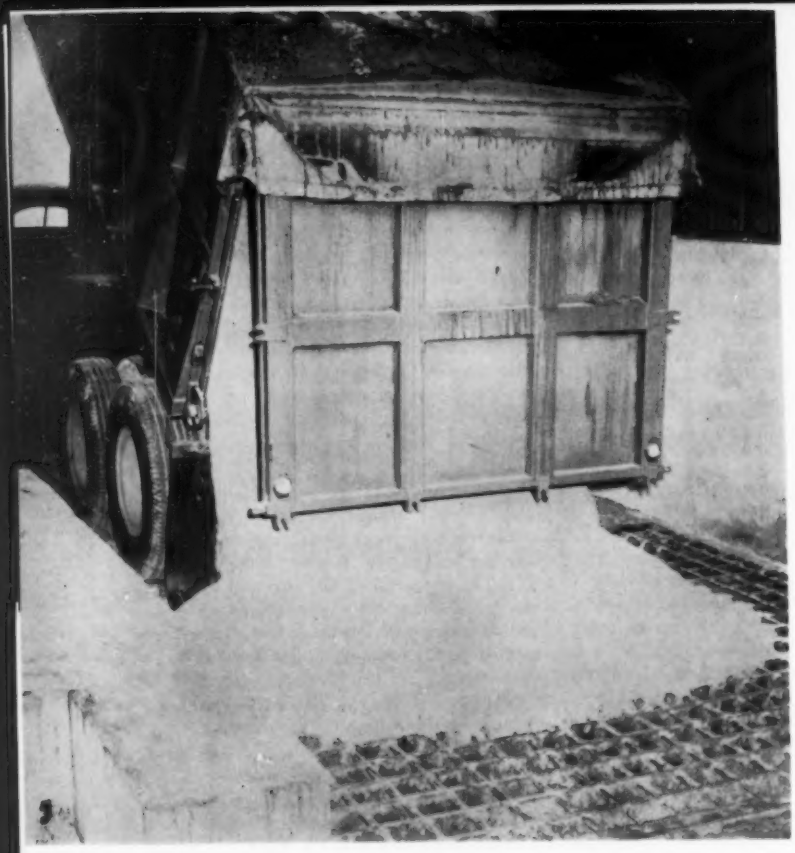
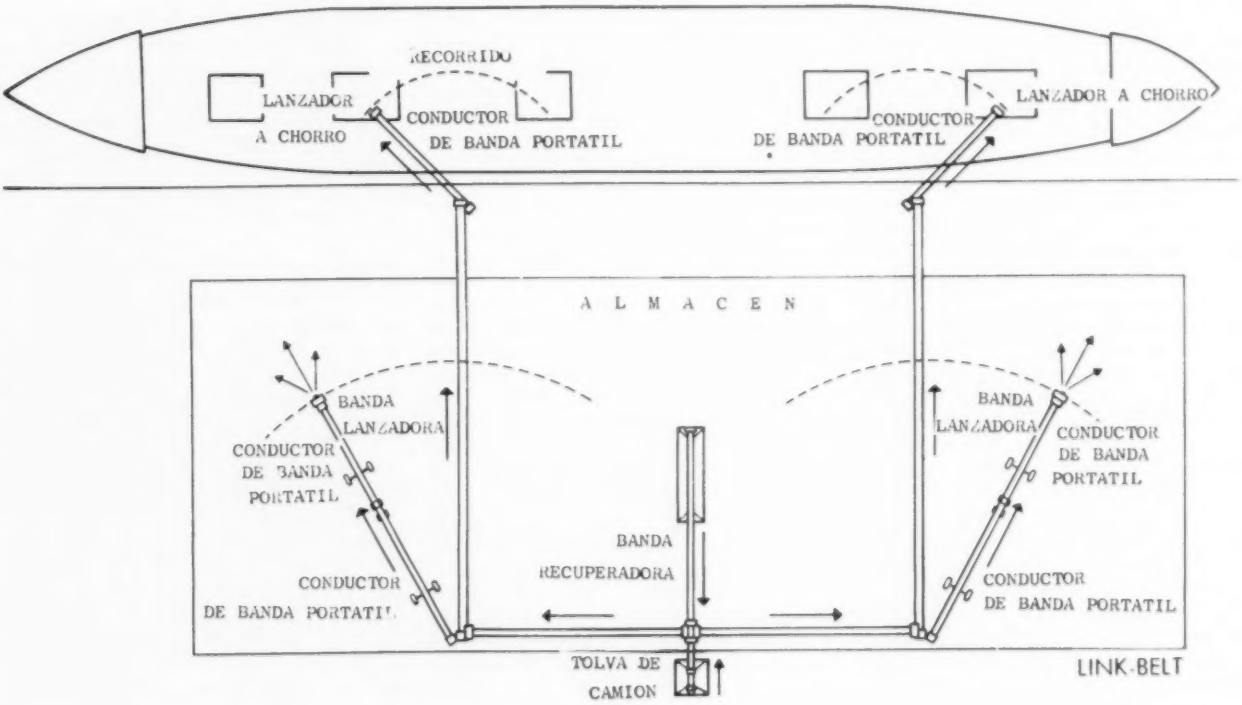


EL PROBLEMA: — La Sugar Service Company, una compañía operadora propiedad del Central San Vicente, Fajardo Sugar Company, Eastern Sugar Associates y la Bull Insular Line, se encontraba ante el problema de manejar los embarques de azúcar crudo a granel recibidos de la central por camión, que tenían que ser transferidos al almacén en el muelle y luego transbordados a los buques. Aunque estas operaciones resultaban relativamente sencillas, fueron objeto de notables modificaciones. A pesar de que la empresa disfrutaba de una franquicia o concesión para mantener sus facilidades portuarias por un período de cinco años, resultaba que el gobierno de Puerto Rico tenía en proyecto un extenso programa para convertir esta tenencia en una importante zona portuaria, con instalaciones permamentes para el manejo de materiales a granel, por lo que no podía contar con una prórroga de tal franquicia más allá de cinco años. La nueva instalación tenía que ser amortizada en el período mencionado, y tenía que proveer un sistema eficiente de manejo a granel sin equipo de carga permanente.

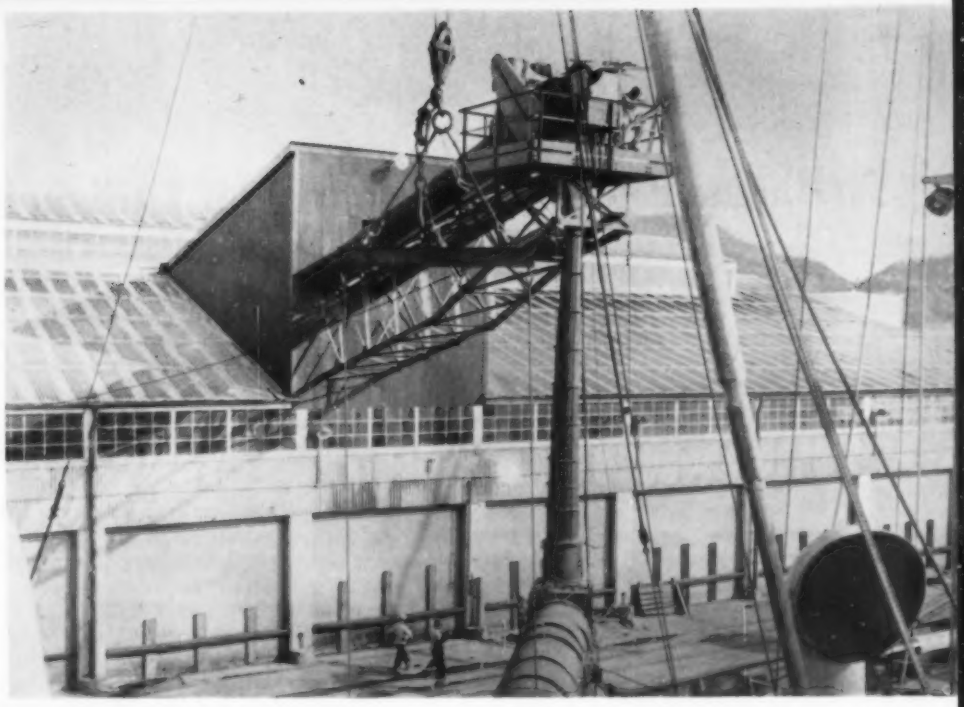
Ingeniosa Instalación en San Juan

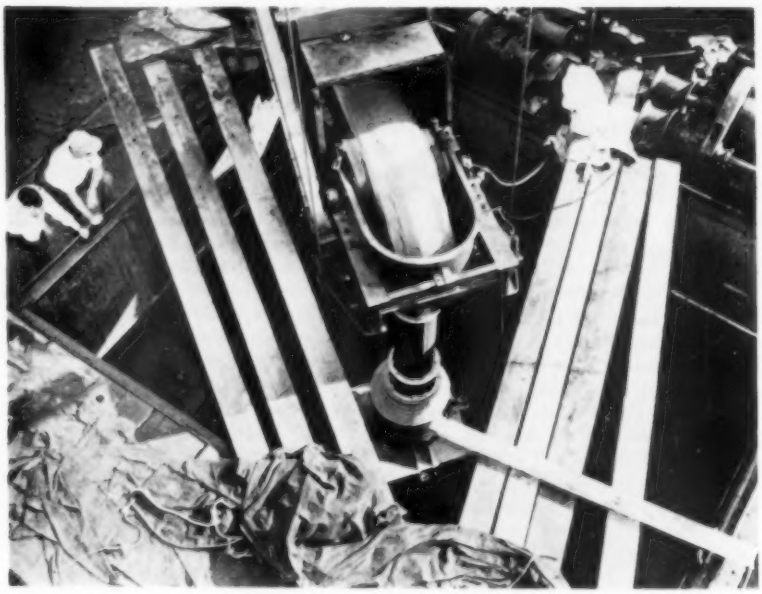
Carga a Granel por Lanzadores a Chorro



El azúcar crudo es entregado al almacén por camiones tipo de volquete automático como el ilustrado arriba a la izquierda. El curso que sigue después se ilustra diagramáticamente en la página opuesta. Al ser vaciado de la tolva del camión, el azúcar cae un un túnel, de donde es recogido por una banda Link-Belt alimentadora que lo conduce al depósito o directamente a la bodega de los buques a razón de 200 toneladas por hora.

El almacén tiene una capacidad de 12,000 toneladas, pero como se anticipaba que la instalación—diseñada por la Link-Belt Company—manejaría 300,000 toneladas en 1958, los ingenieros de Link-Belt tuvieron que adoptar equipo que pudiese mover el azúcar rápidamente. Por consiguiente, el sistema fue diseñado a base de una serie de bandas conductoras y cuatro lanzadores a chorro. El lanzador consta de una banda sinfín corta movida por dos poleas a gran velocidad. Un juego de ruedas locas forma el arco o canal conductor y el ángulo de la trayectoria, que puede ser ajustado alzando o bajando la polea delantera. Un canalón encima del lanzador encamina o dirige el azúcar al declive posterior de la banda, que lo lanza al espacio deseado ya sea en el buque o en el almacén.





Como el azúcar es recibido de las tolvas de los camiones a razón de 200 toneladas por hora, y se carga en las bodegas de los buques a razón de 400 toneladas por hora, es posible agregar a las 200 toneladas entregadas por camión otras 200 toneladas tomadas del almacén, o se pueden tomar las 400 toneladas por hora del almacén. Cada uno de dos conductores inclinados montados en botalones y provistos de lanzadores a chorro, usados para cargar los buques, es capaz de manejar 400 toneladas por hora, cuyo trabajo se puede dividir en diversas proporciones entre los dos aparejos.

Como puede verse en el diagrama inserto, dos de los lanzadores están colocados en los extremos de dos bandas conductoras portátiles. Los otros dos lanzadores se colocan en la bodega de los buques para distribuir el azúcar uniformemente. Tal como puede verse a la cabeza de la página, el azúcar es conducido desde el almacén hasta los buques por bandas conductoras inclinadas que lo transbordan por canalones a modo de telescopio a conductores portátiles en la cubierta de los buques. En el centro de la página pueden verse los conductores portátiles de cubierta cargando azúcar crudo en el lanzador por el canalón telescópico. En la fotografía al pie de la página puede verse el lanzador arrimando o arrumando el azúcar por todas partes de la bodega del buque. El lanzador puede ser

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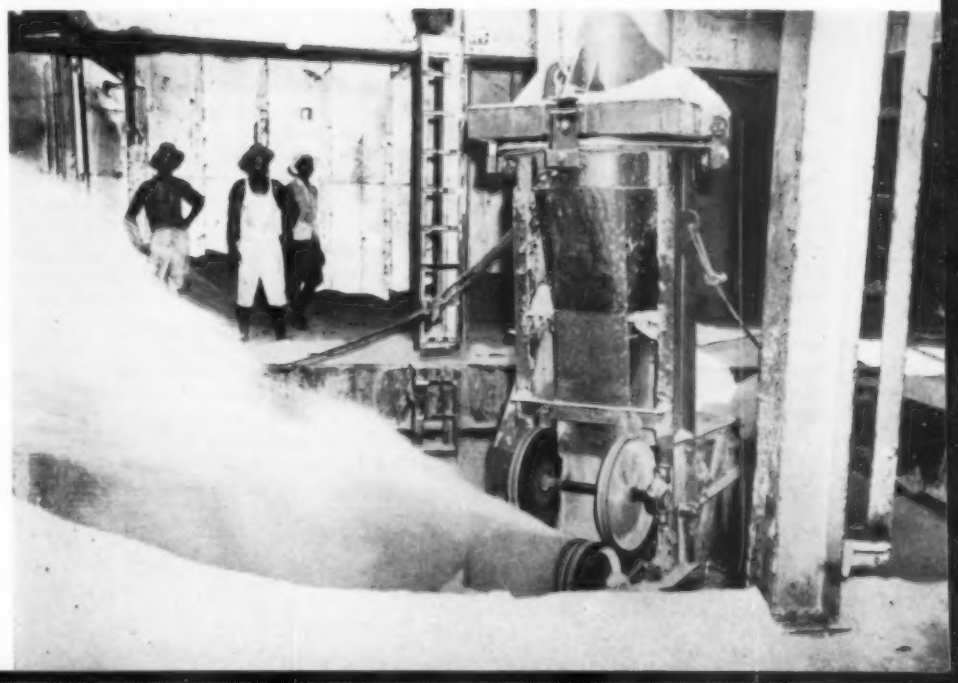

Bases Económicas para la Utilización del Bagazo

Por L. F. Martin

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La caña de azúcar produce aproximadamente tanta fibra como azúcar crudo, aunque la proporción entre estos dos productos varía considerablemente de este promedio en distintas regiones productoras de caña. El bagazo remanente después de la extracción del azúcar por los molinos contiene fuertes cantidades de fibra celulósica. Hace más de un siglo que se vienen buscando asiduamente usos más lucrativos para esta fibra que el quemarla para generar vapor para las fábricas. Se han concebido varios usos para este producto económicamente prácticos y que han dado excelentes resultados, pero la mayor parte de la producción anual de fibra de bagazo calculada en 25 millones de toneladas todavía se quema. Cabe preguntar ¿por qué los usos que han dado buenos resultados no se han extendido mucho más, y por qué otros usos potenciales para esta materia prima en abundancia no se han llevado a la práctica? Nuestra repuesta es que la gran importancia económica de la utilización industrial del bagazo no ha sido tan evidente para otros como lo es para aquellos que tienen un perfecto conocimiento de la producción de azúcar de la caña. Un ejemplo extraordinario, aunque de ningún modo único, del cálculo erróneo del bagazo disponible lo tenemos en un informe de planes para la producción de tabla dura impregnada de resina en la Kekaha Sugar Company en Hawaii.[1] El informe dice que por cada tonelada de azúcar crudo producido se obtienen de 8 a 10 toneladas de bagazo, y que después de satisfacer las necesidades de combustible de la fábrica queda un sobrante equivalente a la mitad de esta cifra. El registro de producción de la Kekaha[2] indica que se usan sólo 7.7 toneladas de caña para producir una tonelada de azúcar crudo; se muele menos de 0.9 de tonelada de fibra seca por cada tonelada de azúcar crudo que se produce. Suponiendo el mejor funcionamiento de los evaporadores de quíntuple efecto y demás equipo de la fábrica, para una producción de 10.000 toneladas de fibra seca resultante de la produción de 50.000 toneladas de azúcar anuales, el sobrante de fibra sería solamente una cuarta parte de la primera cifra. La tabla dura de bagazo se está produciendo económicamente en Taiwan.[3] El proceso proyectado en la fábrica Kekaha podrá ser perfectamente factible técnicamente, pero las consideraciones económicas harían imposible una empresa basada en un acopio de materia prima 20 a 30 veces mayor que la cantidad en realidad disponible.

Se han dado numerosos casos de producción satisfactoria de papal de bagazo, especialmente para periódico, el que ya en el año de 1856 se utilizó para la impresión de los periodiócos 'Baltimore Advocate' y 'Philadelphia Public Ledger'. De vez en cuando hasta el año de 1890 surgieron empresas dedicadas a la manufactura de papel de bagazo, algunas de las cuales obtuvieron cierto éxito temporal. El periódico 'New Orleans Picayune' era impreso en papel de bagazo en 1884. En esa misma época, la National Pulp, Paper & Cordage Company producía 1,400 lbs. diarias de pulpa por el proceso de soda cáustica en Marrero, Louisiana, donde la Celotex Corporation utiliza ahora el bagazo para la producción de tabla aislante. A fines del siglo XVII parecía que el desarrollo de una industria papelera basada en la utilización del bagazo sobrante y sin valor, que los centrales de Louisiana consideraban como una plaga, estaba asegurado. Esto no ocurrió debido a dos inventos revolucionarios. En 1886, Samuel Fiske construyó el primer hogar práctico para quemar bagazo eficazmente y satisfacer así siquiera parte de las grandes contidades de vapor requeridas por las fábricas de azúcar, el cual se generaba anteriormente quemando madera o carbón a un costo elevado. En esa época comenzaron a usarse de modo general los evaporadores de múltiple efecto inventados por Rillieux; esta innovación, más el hogar para quemar bagazo introducido por Fiske, hicieron posible obtener todo el vapor necesario del combustible derivado del despojo de la fábrica. El bagazo ya no se consideraba como despojo. Su costo tenía que ser calculado de acuerdo con los precios de combustibles alternativos, por lo que resultó ser demasiado alto para la joven industria papelera.

La disponibilidad de gas natural barato en Louisiana desde 1920 ha hecho que todo el bagazo producido en esa región se pueda dedicar lucrativamente a otros fines, tal como sucedía antes de 1890 cuando su valor para combustible era insignificante porque no se habían perfeccionado medios para poderlo quemar efectivamente. Las nuevas variedades de caña que se cosechan al cabo de un corto ciclo de crecimiento contienen relativamente más fibra, por lo que en Louisiana se produce más fibra por tonelada de azúcar que en ninguna otra región productora de caña. No obstante estas ventajas, los productos derivados del bagazo que se vienen explotando comercialmente consumen menos de lo mitad de la producción anual de esta fibra. La Celotex utiliza aproximadamente el 35 por ciento del bagazo disponible en un radio de 100 millas de su planta en Marrero, Louisiana. Otro 10 por ciento se emplea en pasta para productos de plástico, papel, cobertera hortícula y agrícola y forraje de bagazo y melaza, dejando más de la mitad del acopio para ser quemado. En contraste con Luisiana, algunas regiones tropicales cosechan cañas con menor contenido de fibra que tienen de doce a dieciocho meses de crecimiento, por lo que sólo se necesitan 8 a 9 toneladas para producir una tonelada de azúcar crudo. Con menos de una tonelada de fibra seca por tonelada de azúcar, ni siquiera todo el bagazo disponible basta para producir el vapor que necesitan aquellas fábricas que no son muy eficientes, las cuales tienen que usar combustible adicional mucho más costoso.

Otros escritos in la serie informan sobre procesos representativos establecidos comercialmente para utilizar bagazo y sobre otros usos potenciales y prometedores que aún se encuentran en la etapa de desarrollo. Algunos incluyen una discusión de los aspectos económicos así como datos técnicos esenciales o resultados experimentales relacionados con estos procesos. Como base para estos informes, las difiniciones dadas en la Tabla 1 de las variantes económicas y relaciones generales entre ellas que se pueden desarrollar para aplicarlas a cualquier uso, existente o propuesto, son esenciales. Los datos sobre cualquier proceso tendrán que ser proporcionados para las distintas localidades donde se proyecta usarlos. El estudio de los factores económicos que contribuyen al éxito de usos establecidos que son comercialmente lucrativos deben ofrecer la mejor guía para predeterminar la probabili-

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* *Uno de los laboratorios de la División Meridional de Estudios Sobre Usos y Desarrollo, Servicio de Estudios Agrícolas, Depto. de Agricultura de E. U. A.*

dad de éxito o fracaso de nuevos procesos o productos a base de bagazo. La historia del desarrollo de la Celotex registrada por Lathrop[4] es sumamente instructiva en cuanto a la expansión de procesos existentes o de nuevos usos para el bagazo. El subtítulo de su artículo hace esta pregunta: ¿Bagazo o Azúcar, el Subproducto? Los 25 años transcurridos desde que apareció este artículo han dado la respuesta a esta pregunta; el azúcar sigue siendo el producto principal, y el bagazo es el subproducto que tendrá más amplia aplicación si su uso se desarrolla sobre bases económicamente prácticas.

Tan pronto como se ha demostrado la posibilidad de convertir el bagazo en un producto potencialmente útil mediante experimentos de laboratorio, cualquier trabajo en planta experimental o desarrollo semicomercial debe ser precedido de un detenido estudio económico. Es necesario determinar desde el principio las posibilidades de venta del producto y la cantidad que se podrá vender, y esto podrá necesitar una pequeña planta piloto para obtener suficiente cantidad del producto de que se trate para fines de evaluación. El estudio de mercados potenciales y exploración de posibles aplicaciones para un producto nuevo resultan más fáciles si se hacen disponibles suficientes cantidades para prueba. La predeterminación de la probable demanda a precios que dejen un margen se puede hacer con mayor exactitud para productos como el papel destinados a competir en un mercado establecido abastecido por otras materias primas. La determinación, tan exacta como sea posible, de las cantidades que se necesitarán es esencial en la selección de la región donde se pueda obtener la materia prima económicamente. Las evaluaciones de mercados para los principales productos de bagazo disponibles, por Goldsborough & Anderson,[5] sugieren los datos que es necesario reunir y cómo estudiarlos. Tales evaluaciones incluyen papel y cartón, pulpa, tabla de fibra para obras, furfural, y bagazo deshidratado, los cuales compiten en el mercado con productos similares producidos de otras materias primas. Se presta especial atención a las tendencias del mercado y a la posible competencia que los productos a base de bagazo tendrán que confrontar en el futuro. Aunque lo relacionado con las ventas no entra en esta discusión, los principales factores considerados en el estudio son: desarrollo de la industria y del mercado, tendencias de precios y ganancias, calidad relativa del producto derivado del bagazo y de otras materias primas en competencia, y competencia en el mercado.

El siguiente paso lógico será encontrar fuentes de bagazo en suficiente cantidad para obtener la cantidad del producto calculada, y escoger entre ellas la que esté mejor situada con respecto a la ubicación de la planta y territorio donde ha de ser vendido el producto. En todas las regiones productoras de caña en el mundo se encuentran datos estadísticos de la producción de azúcar, pero los tonelajes aproximados de la fibra seca y azúcar producidos en estas regiones no son suficientes. La producción de fibra en cada fábrica de azúcar varía entre el mínimo de 0.7 de tonelada por tonelada de azúcar en Hawaii hasta cerca de 2 toneladas en Louisiana. Todas las fábricas no son igualmente eficientes en la extracción y rendimiento de azúcar, con el resultado que la producción de fibra varía dentro de la misma región productora de azúcar. La tendencia de producción debe ser basada en datos de varios años, tomando en cuenta las variaciones entre campañas y los posibles acontecimientos en la industria que puedan afectar la producción futura de bagazo. Por ejemplo, la industria azucarera de Louisiana recobró rápidamente de su baja producción en 1926 resultante de la enfermedad del mosaico. Subsiguientemente, la introducción de nuevas variedades de caña resistentes al mosaico y con mayor contenido de fibra, el cambio durante la guerra del corte de la caña a mano al sistema de recolección a máquina, y los cambios en el monto de las cosechas conforme a las cuotas de producción, todo hizo necesario ajustes en las industrias consumidoras de bagazo en ese estado.

El costo del bagazo que se puede substituir económicamente con otros combustibles se puede obtener gráficamente del cuadro publicado por Gastrock & Lynch,[6] el cual se basa en los valores térmicos del bagazo y de combustibles alternativos como gas, petróleo o carbón. Las eficiencias de las calderas en las fábricas también son tomadas en cuenta. La Celotex Corporation ha pagado 50 centavos más por tonelada de fibra seca que el costo real del gas natural para reponerla. La tendencia futura en el consumo y precio de cualquier combustible alternativo elegido es importante; el costo del bagazo ha fluctuado de acuerdo con los cambios en el precio de gas natural en Louisiana. En los trópicos, donde se produce la mayor parte de la caña, los combustibles que pueden substituir al bagazo no se encuentran disponibles localmente, y su importación resulta costosa. El gobierno de la República Dominicana hizo una concesión al permitir la importación de petróleo libre de derechos durante diez años para reponer el bagazo utilizado en la producción de furfural en el Central Romana en ese país.[7]

Donde no existen combustibles alternativos, o donde éstos resultan demasiado costosos, la cantidad de bagazo sobrante después de satisfacer las necesidades de las fábricas tiene que ser estimada, por lo que su valor no se puede calcular tan fácilmente. Algunas fábricas modernas pueden alcanzar eficiencias térmicas bastante elevadas para tener algún bagazo sobrante. Donde el bagazo no tiene otra salida lucrativa, la operación de la fábrica con una eficiencia térmica menor de la máxima es la forma más fácil de deshacerse del exceso de bagazo. Para calcular la cantidad de bagazo que puede sobrar hay que estudiar la economía térmica potencial del equipo en servicio y los informes de operación actual. Los principios en que se puede basar un cálculo cabal fueron concebidos hace muchos años por Webre,[8] los que se pueden aplicar a los balances térmicos de cada fábrica para obtener cálculos al día del por ciento de fibra en la caña molida. Las prácticas de molienda son importantes, porque la cantidad de agua empleada en la maceración afecta el consumo de combustible tanto como el contenido de fibra en la caña.

Suárez-Carreño[9] ha calculado que una fábrica eficiente tendrá un déficit cuando se usa 25 por ciento de agua de maceración en cañas con un contenido fibroso de 11 por ciento, y un sobrante (de bagazo) alrededor de 31.4 por ciento cuando la caña contiene 13 por ciento de fibra y se le aplica 15 por ciento de agua de maceración. Villamil[10] informó de un sobrante de casi 40 por ciento en un central cubano produciendo mieles invertidas durante la campaña de 1954, el cual pudo haber sido aumentado a la mitad de la producción total de bagazo instalando calderas modernas más eficientes; esto se hizo posible sólo porque se trataba de azúcar cristalizado.

Un estimado más práctico para campañas

Tabla I. Variantes económicas que rigen la disponibilidad y costo del bagazo como materia prima.

Cantidad de Bagazo Necesaria[5]:
- Para Productos No-Competitivos o Nuevos—
  - Territorio
  - Demanda potencial
  - Calidad o propiedades necesarias
  - Precio relativo al volumen
  - Costo de desarrollo de mercados y ventas
- Productos Competitivos—
  - Territorio y tendencias de distribución
  - Volumen y tendencias de volumen
  - Costo de venta y tendencias de costos
  - Diferencias de calidad y mejoras

Acopio de Bagazo:
- Bagazo Total—
  - Área de producción relativa al mercado
  - Producción de caña y fibra y tendencia de producción
  - Epoca de producción—
    - Almacenaje y manejo
    - Epocas de elaboración
    - Restricciones de producción (cuotas)
  - Combustibles alternativos[6]—
    - Costo actual
    - Acopio y tendencias de costo
- Bagazo Sobrante—
  - Las *primeras cuatro* variantes antes citadas
  - Sobrante actual
  - Eficiencias de fábricas[8]
  - Eficiencias obtenibles
    - Equipo existente
    - Equipo mejorado

Costos de Desarrollo[12]:
- Productos Nuevos—
  - Desarrollo de plantas experimentales
  - Exploración de mercados
  - Desarrollo semicomercial
  - Relación del costo al volumen
- Productos Competitivos—
  - Desarrollo limitado de plantas experimentales
  - Mejora de calidad
  - Reducción de costos

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normales con equipo de molienda y de fábrica existente es 15 por ciento,[11] o sea como la mitad del sobrante máximo calculado.

Conviene hacer resaltar el hecho que la molienda de caña de azúcar es una operación temporal en la mayoría de regiones productoras de caña, por cuya razón cualquier planta que utilice bagazo tiene que almacenar suficiente cantidad para poder operar todo el año. En Louisiana, todo el bagazo se produce en dos meses de molienda; en el otro extremo, los centrales en Hawaii muelen 7 a 10 meses durante el año. El almacenaje en grandes pilas durante varios meses da lugar a la fermentación de azúcares remanentes en el bagazo y reduce su humedad, lo que produce un efecto preservador deseable a costas de la pérdida de alguna fibra. La experiencia ha demostrado que los costos de manejo son mucho mayores que el precio pagado por el bagazo al salir de los molinos, aunque se trate de fuertes cantidades. Estos costos fueron calculados por Keller[12] para Louisiana en 1952, cuando el bagazo seco fué comprado por $2.50 la tonelada f.a.b. fábrica, pero le costó al consumidor alrededor de $11.00 por tonelada de fibra seca entragada en plantas dentro de un radio de 100 millas.

Por último, hay que determinar el costo de elaboración para convertir el bagazo en un producto acabado. El desarrollo del proceso en una planta experimental en gran escala será justificado si el cálculo del acopio y costo de la materia prima es económicamente favorable. Los procesos nuevos tendrán que ser estudiados en plantas experimentales para determinar las condiciones óptimas de operación, los materiales químicos, vapor, fuerza, mano de obra, etc., que se necesitarán, durante cuyo estudio también se obtendrán los datos necesarios para determinar los costos de fabricación. Los métodos descritos en libros de texto sobre este tema[13] son aplicables al cómputo de

(*Sigue en la página* 70)

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868 CFM 100 PSI 17-10 x 12 CP-OCB
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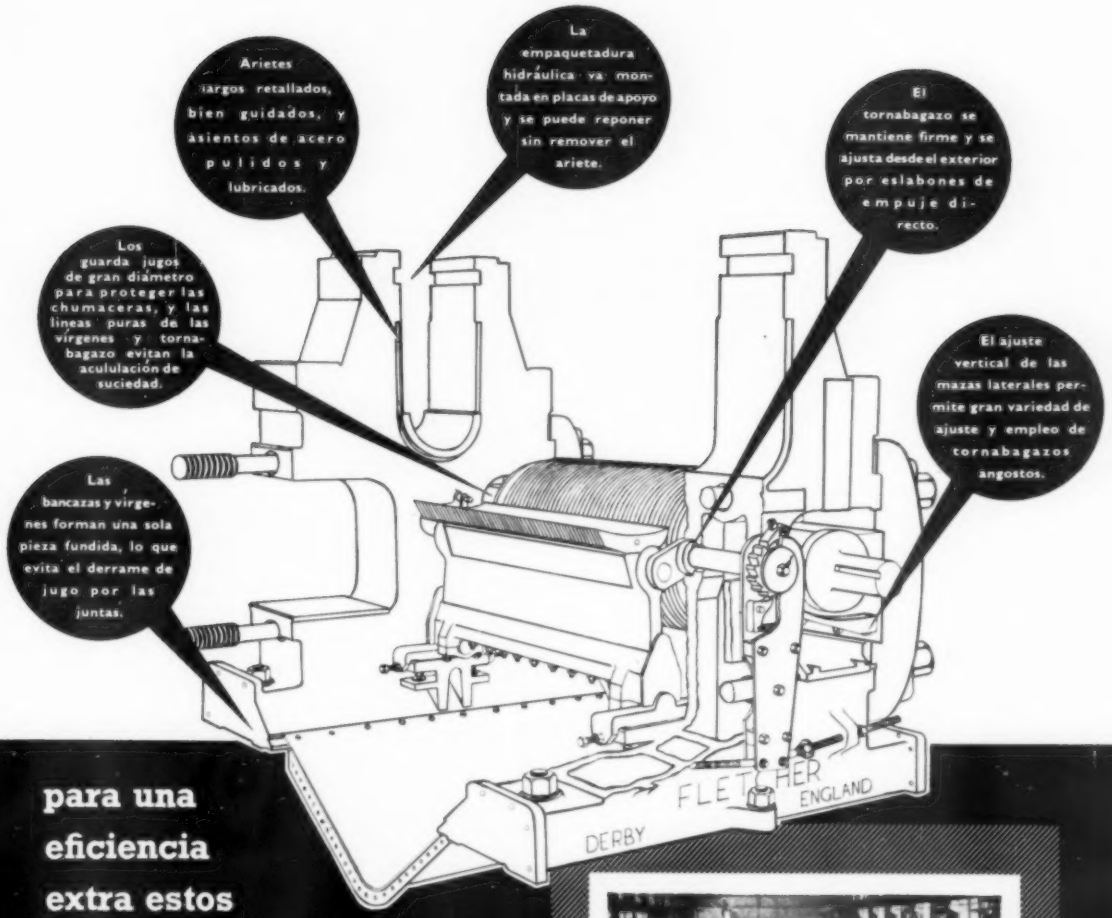

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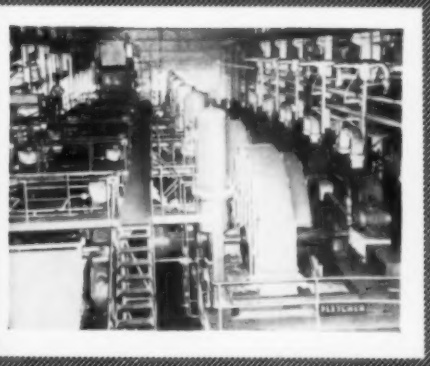

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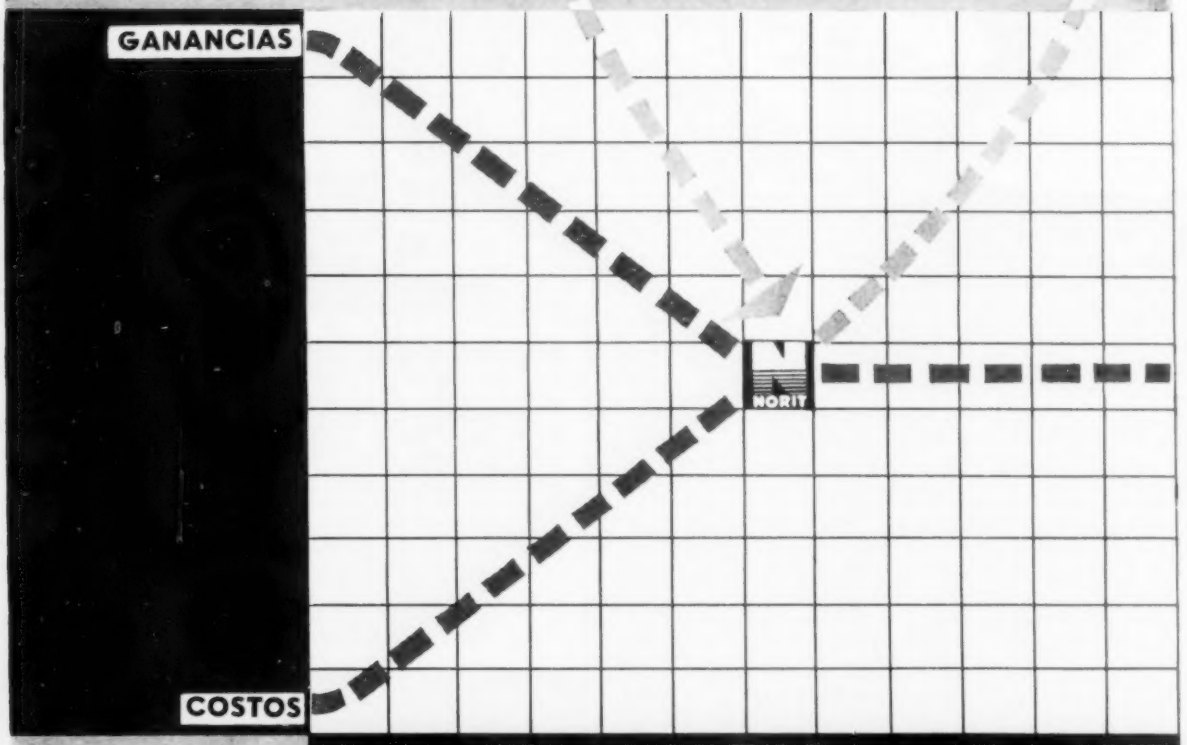

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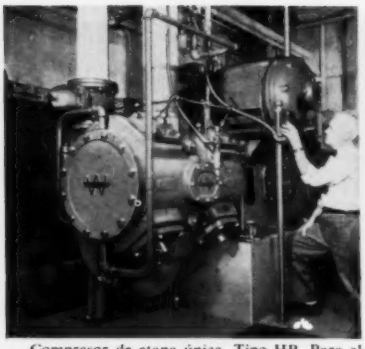

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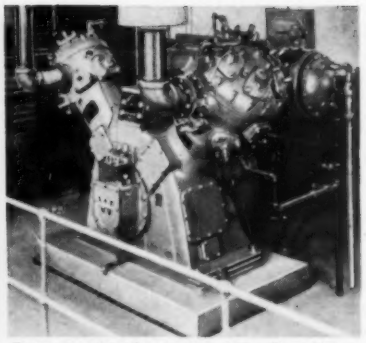

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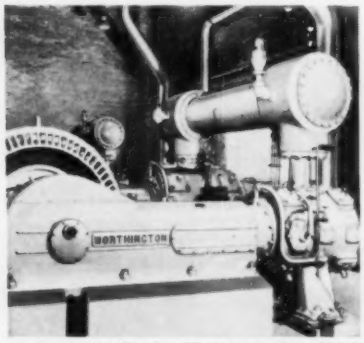
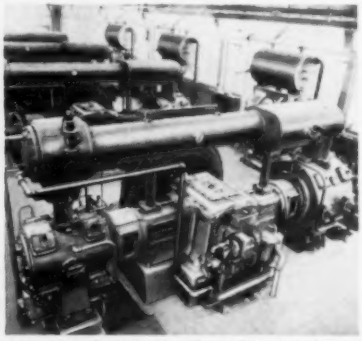


Compresor Duplex Horizontal, Tipo DC-2. De dos etapas, para servicio pesado. Tamaños: de 250 a 3.000 h.p. (Boletín L-675-B1B)



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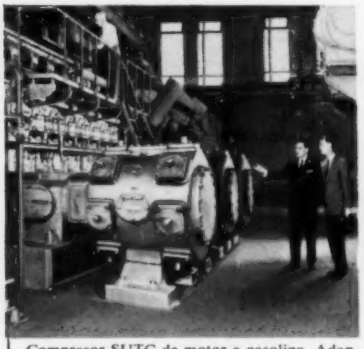

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Para cualquier trabajo de compresión de aire, la amplia línea stándard Worthington tiene el compresor requerido con su correspondiente equipo de transmisión. Tamaños: hasta de 10.000 h.p. para aire o gas comprimido hasta a 35.000 lb/pulg. cuad. Para más informes, diríjase al distribuidor más cerca de su localidad, o a: Worthington Corp., Departamento O.C., Harrison, N. J., U.S.A.

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CUTISA, Maracaibo

ENERGIA PARA LA INDUSTRIA

En la modernización del Central Hershey de Cuba, se utilizó al máximo el material General Electric. En primer plano puede verse una nueva instalación de distribución tipo intemperie, que incluye los transformadores.

Los equipos G-E contribuyen al éxito económico de la modernización del Central Hershey de Cuba

Los nuevos equipos eléctricos G-E contribuyeron a reducir los costos de explotación y a mantener el alto nivel de producción

La continuidad de producción y la economía de explotación de un central azucarero dependen en gran medida de la seguridad de funcionamiento de los equipos eléctricos. Además, la instalación de distribución debe ser capaz de absorber, en forma eficaz y económica, las fluctuaciones de carga propias de la industria. Por ello, la dirección del Central Hershey solicitó el concurso de la General Electric para la realización de sus importantes planes de modernización. Como resultado, en el Central Hershey se instaló un turbogenerador G-E de 6250 KW, que asegurará la continuidad de suministro, permitiendo obtener máxima producción con una inversión mínima de combustible.

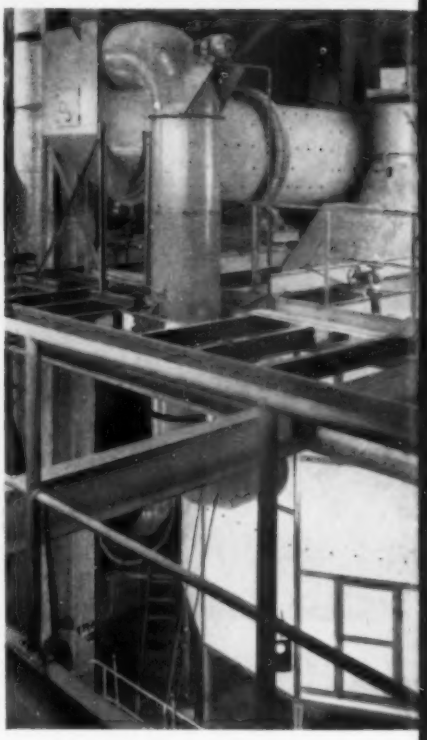
Por otra parte, se instalaron también transformadores, interruptores automáticos tipo intemperie, tableros de control de turbinas y otros equipos de maniobra que aseguran la continuidad de servicio y la economía de funcionamiento.

El Central Hershey es otro ejemplo de cómo "una sola fuente de suministro", la General Electric, puede simplificar un importante plan de modernización. Para más detalles sobre las ventajas que le ofrece la General Electric a través de sus servicios técnicos, su experiencia y sus productos de alta calidad, diríjase al representante G-E de su localidad o escriba a: *International General Electric Co., Dept. 58-51S, 150 East 42nd Street, New York 17, New York., U.S.A.*

El programa de modernización del Central Hershey incluyó la instalación de un nuevo turbogenerador de 6250 KW, así como tableros G-E de distribución y de control de turbinas.

GENERAL ELECTRIC

—E.U.A.—



Secado y Enfriamiento del Azúcar

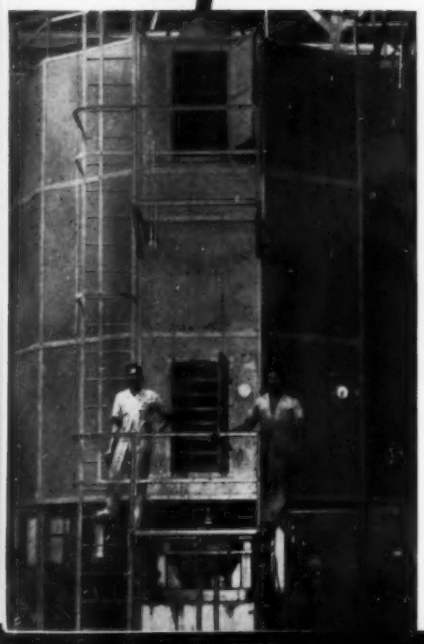
Desea Ud. que

su azúcar acuse calidad suprema – cristales conservados de brillo insuperable a la par de nítidas aristas,

azúcar que permita ser almacenado a granel o envasado inmediadamente en sacos con ayuda de un equipo de construcción robusta, que apenas requiere asistencia, ni mucho más mantenimiento, a más de consumir poca fuerza motriz,

Büttner le ofrece el turbo-secador enfriador realmente indicado

Se cuentan por cienes los secadores y enfriadores Büttner que trabajan a entera satisfacción en los más modernos ingenios azucareros de Europa y Ultramar. Más de 1300 turbo-secadores han sido construidos por Büttner para variadísimos productos. El número de nuestros clientes en Central y Sud-America va incrementando constantemente. El turbo-secador es una construcción de Büttner, ideada y desarrollada por sus propios ingenieros.



80 años de experiencia en la Industria Azucarera

Tanto nuestro SERVICIO como nuestros ingenieros especializados están a su entera disposición Sírvase Ud. pedir literatura.

Sucursales: U. S. A.: Buttner Works Inc., 52 Vanderbilt Ave., New York 17, N.Y

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SQUIER

PARA EL MANEJO ADECUADO DE LA CAÑA

PARA ASEGURAR CAPACIDAD MAXIMA

- **MESAS DE ALIMENTACIÓN DE CAÑA**
  Las Mesas de Alimentación de Caña Squier, de construcción rígida de barras en ángulo con refuerzo de ángulos macizos, proporcionan una alimentación uniforme, bien controlada, de caña al conductor. Se monta fácilmente y su operación es sencilla. El tamaño de norma es de 18′ por 20′.

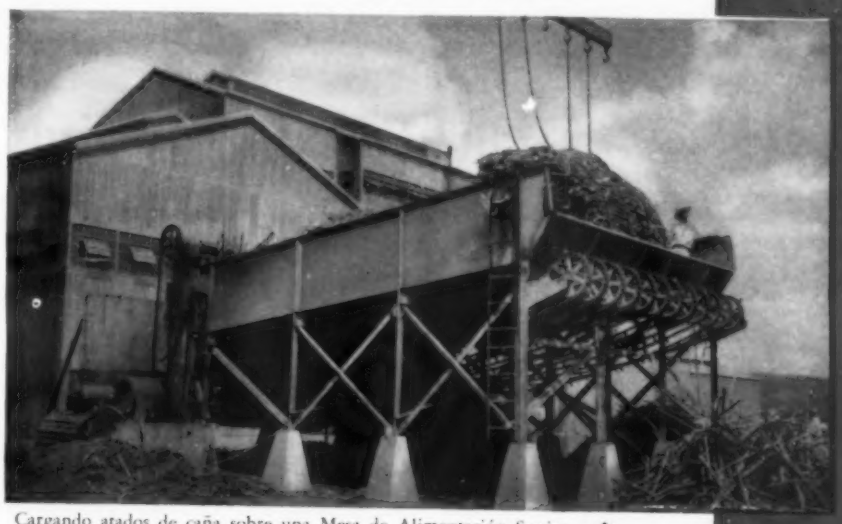
- **CONDUCTORES DE CAÑA**
  Los Conductores de Caña Squier son de construcción duradera totalmente de acero con cadena de acero de alta resistencia a la tracción y tablillas de doble corrugación. La velocidad se puede variar fácilmente para obtener la correcta alimentación por medio de controles accesibles.

- **NIVELADORES DE CAÑA**
  Los Niveladores de Caña Squier, o Gallegos, están debidamente espaciados a través de los conductores, antes de las cuchillas, para anivelar los montones en el colchón de caña que se alimenta al trapiche.

- **CUCHILLAS CAÑERAS**
  Las Cuchillas Squier de "larga vida" son de diseño especial nuevo que permite que al gastarse las cuchillas se afilen por sí solas. Su corte espiral resulta en un flujo uniforme de caña cortada. Tanto las cuchillas como el volante van balancea-dos en la fábrica. Las chumaceras son de diseño de cojinete extra fuerte lubricadas por anillos.

- *SQUIER no solamente tiene el equipo para solucionar sus problemas de manejo de la caña, sino se encuentra listo para ayudarle en todo posible con sus recomendaciones técnicas. Solicite mayores detalles sobre éste o cualquier otro problema azucarero hoy mismo.*

Los Niveladores Squier al extremo derecho de la Mesa anivelan los montones de caña al encaminarse ésta hacia las cuchillas debajo de la cubierta metálica a la izquierda. Puede verse a la izquierda el volante en el eje de las cuchillas.



Cargando atados de caña sobre una Mesa de Alimentación Squier en una fábrica de 2000 toneladas de capacidad. Obsérvese la construcción maciza en extremo. Las ruedas dentadas son de diseño partido para facilitar tanto la instalación como la reparación.

THE SQUIER CORP.

INGENIEROS Y FABRICANTES

BUFFALO, NEW YORK, E.U.A.

"Desde la Caña hasta el Saco"

SQUIER

CARGA RAPIDA—El Primer Paso Hacia el Acarreo Rápido de la Caña—con la Cargadora Bucyrus-Erie 22-B para Servicio Pesado

Con la Cargadora de Caña Bucyrus-Erie 22-B, el equipo de acarreo pesado se carga rápidamente, lo que acelera el transporte de la caña a la fábrica.

La Cargadora 22-B es fácil de manejar. Los dos cables del arpeo de caña son gobernados por una sola palanca, lo que le permite agarrar plena carga rápidamente. Un tensor automático en el cable de suspensión hace su operación uniforme y segura. La gran velocidad de los cables y rápido viraje del botalón aceleran la operación de carga. La situación de la carga se hace con precisión porque el izador independiente del botalón, gobernado mecánicamente, permite cambiar el ángulo del botalón en cualquir punto del ciclo. Sus carriles tipo de tractor, con trinquetes de retención de avance positivos y su propulsión a dos velocidades, hacen sus movimientos positivos y seguros.

Las Cargadoras 22-B son universalmente famosas por su servicio seguro día trás día, lo que resulta todavía más importante en cañaverales alejados del taller de reparación, donde cualquier avería puede ocasionar fuertes pérdidas de producción.

Averigue por qué la adquisición de una Cargadora de Caña 22-B de Servicio Pesado es el primer paso más acertado hacia el acarreo rápido de la caña. Obtenga datos completos del distribuidor de Bucyrus-Erie en su comarca, o escríbanos directamente.

402E57

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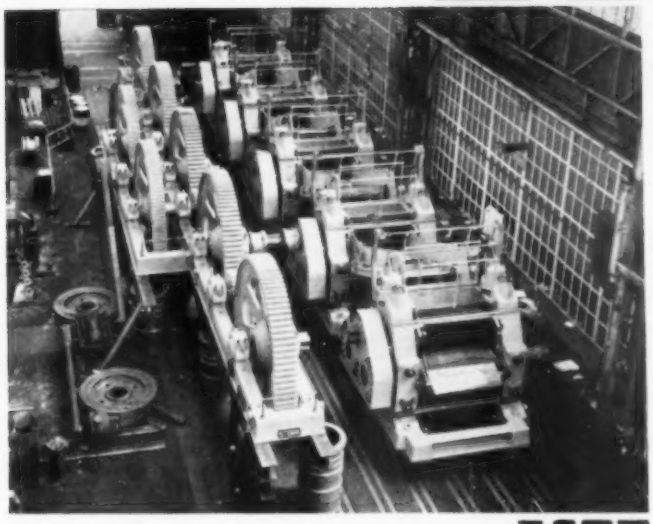
Fábricas completas desde la caña hasta el azúcar



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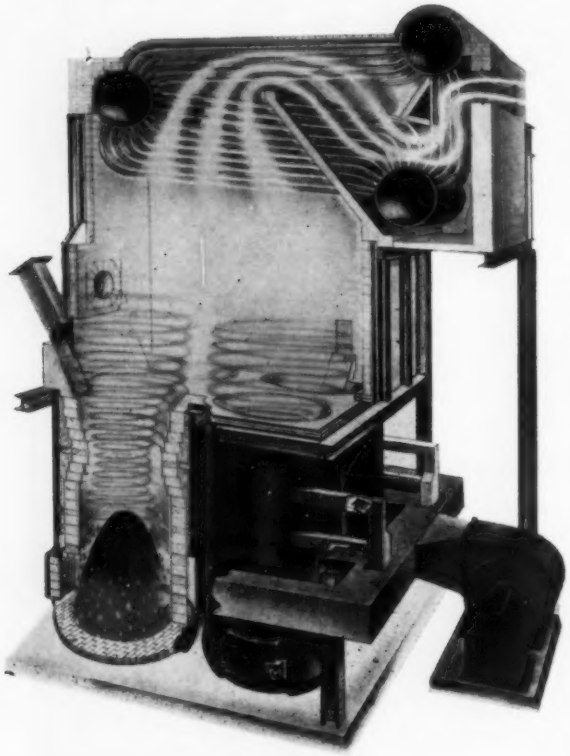
PARA MAQUINARIA AZUCARERA EN GENERAL DIRIJASE A GEBR. STORK & CO. N.V., HENGELO, HOLANDA

DETRICK-DENNIS . . . el Hogar Multicelular con

Whirl Wind ACTION

UNA INNOVACION REVOLUCIONARIA EN HOGARES PARA BAGAZO



Probado y Comprobado en Siete Años de Desarrollo

La práctica demostró que el Hogar Detrick-Dennis Multicelular es un adelanto fundamental en la conversión de conbustibles de despojos a vapor, con importantes ventajas funcionales y económicas probadas por casos auténticos. Ejemplos:

- La acción turbulente regulada hace que floten las partículas finas, las que son quemadas en suspensión, y permite quemar las partículas más pesadas más rápidamente.
- Pleno rendimiento de la caldera en todo momento. El hogar se puede limpiar sin interrumpir el servicio. Previsión para el empleo exclusivo de combustible auxiliar durante paros del tren de molienda.
- Menor costo de conservación (un usuario anuncia una reducción de 95%). No se necesitan piezas mecánicas. La conservación de trabajos de manpostería se elimina casi por completo.
- Agotamiento total del carbón en la cámara de combustión. No quedan residuos ni se necesita sistema de reinyección.

Usted debe estudiar este asunto por su propio bien. Véa el inserto a continuación.

¡OBTENGA DATOS COMPLETOS!

Este boletín debiera ser leído por la gerencia y personal de centrales azucareros. Contiene una descripción detallada del hogar Detrick-Dennis y explica porqué produce resultados apenas aproximados hasta ahora. Incluye datos de funcionamiento preparados por dueños de este equipo. Solicite el Boletín D-29 hoy mismo.

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UNIDADES DE FUERZA INTERNATIONAL

rinden con exactitud su potencia nominal!

Aquí una diesel IH bombea 7570 lpm para irrigar 81 hectáreas de tierras de cultivo. Tal como en otras aplicaciones de bombeo, las Unidades de Fuerza IH proporcionan un servicio confiable y exento de dificultades, más economía en mantenimiento y operación.

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Son comunes en las obras de irrigación y construcción. Pueden verse en los campos petroleros, canteras, minas y campos madereros. Y sirven, además, como fuerza eléctrica de reserva en las industrias y comunidades.

No importa cuál sea la labor, dispone International de una amplia variedad de unidades de fuerza con potencias nominales auténticas para satisfacer sus necesidades en particular. Cualquier unidad IH que Ud. escoja ha sido sometida a minuciosas pruebas para verificar que rinde toda su potencia nominal.

Todas las unidades International se construyen para aplicaciones industriales pesadas. Se destacan por su economía de 4 tiempos, fácil mantenimiento, más su línea completa de equipo accesorio para diversas aplicaciones.

Para especificaciones completas, vea al distribuidor IH —o escriba solicitando catálogo.

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Hay seite unidades diesel IH—cinco motores de 6 cilindros y dos de 4 cilindros, de 60 a 250 hp. Sus económicas características incluyen:

- Conversión a gasolina para arranques a cualquier temperatura.
- Sistema de inyección de combustible a precisión con reserva de control de torsión para una fuerza máxima.
- Insuperable sistema de filtración de combustible.
- Filtración de aceite de flujo completo.
- Sistema de lubricación a plena presión. Pasajes de aceite taladrados con estrías.
- Componentes de unidad de fuerza para trabajo pesado.

Más muchas otras características que contribuyen a un funcionamiento a bajo costo.

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Hay cinco unidades de 4 cilindros y siete de 6 cilindros con potencias de 16.5 a 255 hp. Varios motores pueden equiparse para que funcionen con gasolina, gas natural, kerosene, alcohol, destilado o GPL. Se diseñan para que rindan el máximo de fuerza con cada gota de combustible.

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La mayor planta siderúrgica del mundo situada a orillas del mar, es la gran fundición Bethlehem, en Sparrows Point, en el puerto de Baltimore, E.U.A. El embarque directo de los productos de exportación ahí mismo en el puerto, redunda en doble ventaja para el comprador.

Primera, elimina las demoras de largos acarreos terrestres.

Segunda, al reducir el manipuleo, reduce la posibilidad de averías.

Nuestra planta en Sparrows Point sirve desde hace años los mercados de exportación. Su situación a orillas del mar permite la economía de días y aun semanas en la tramitación de los pedidos de acero. Bethlehem Steel Export Corporation, 25 Broadway, New York 4, U.S.A. Cablegramas: "BETHLEHEM, NEWYORK."

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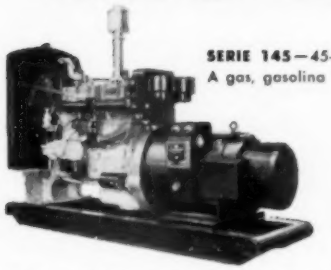
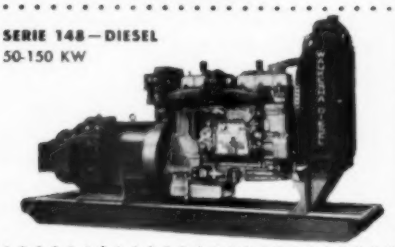
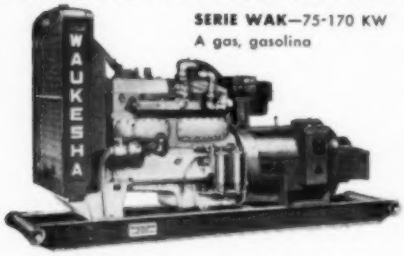


SERIE 145—45-110 KW
A gas, gasolina



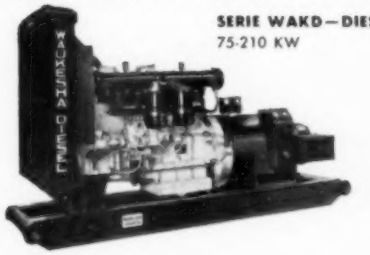
SERIE 148—DIESEL
50-150 KW



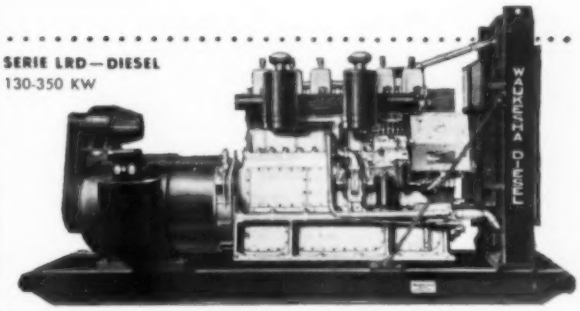
SERIE WAK—75-170 KW
A gas, gasolina

• Una línea soberbia de Enginators (grupos electrógenos)—respaldados por más de 50 años de experiencia en la construcción de motores de combustión interna para servicio pesado y equipo eléctrico. Para rendimientos de confianza con todos los combustibles, estas combinaciones de generador y motor Waukesha equilibradas con toda precisión, suministran energía eléctrica en forma suave y uniforme para servicio continuo, intermitente y de reserva.

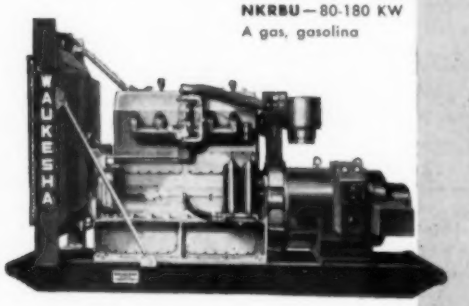
Capacidades de 50 a 700 KW—funcionamiento con gas natural, gas licuado de petróleo, gasolina, y combustible Diesel con aspiración normal o turbocargado.



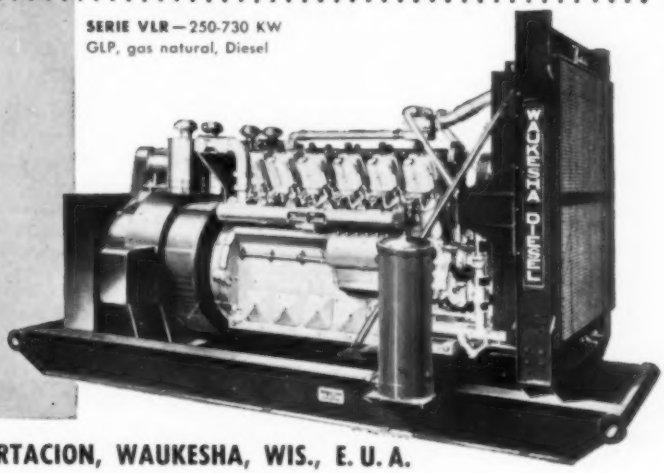
SERIE WAKD—DIESEL
75-210 KW



SERIE LRD—DIESEL
130-350 KW



NKRBU—80-180 KW
A gas, gasolina



SERIE VLR—250-730 KW
GLP, gas natural, Diesel

SOLICITE FOLLETOS DESCRIPTIVOS
DE ESTOS Y OTROS MODELOS

WAUKESHA MOTOR CO., DEPTO. DE EXPORTACION, WAUKESHA, WIS., E. U. A.

Extractos de Publicaciones Azucareras

Publicados bajos los Auspicios de la Sociedad Internacional de Tecnólogos Azucareros de Caña por Arreglo Especial con SUGAR y AZUCAR—Dr. O. W. Willcox, Redactor Técnico

Tecnología

El Proceso "Werquin" y el Filtro "Immedium"

B. BERNADAC, *Industries Alimentaires Agricoles*, págs. 629-636 (1957).

El jugo de remolacha crudo se alcaliza al llamado "punto Werquin", al cual el valor CaO total menos CaO soluble en el jugo es 0.4 gramo/litro; esto generalmente require la adición de unos 4.2 g/l de cal. La precipitación así formada se elimina por la filtración después de que el jugo alcalizado es recalentado a 85° C. El filtro empleado en este trabajo es un tanque vertical lleno de cinco capas de arena de diferentes granulaciones, desde 0.42 mm en el fondo hasta 0.15 mm en el tope. El jugo alcalizado entra por el fondo, fluye hacia arriba y pasa a través de un segundo recalentador a un tanque, donde recibe otra aplicación de 0.40 g/l de cal, lo que es seguido de la carbonatación a razón de 0.21 g/l para reducir la alcalinidad del jugo. El jugo carbonatado se hace pasar por un segundo calentador y de allí a otro filtro de arena similar, de donde pasa a los evaporadores. El flujo óptimo a través del sistema es 4 a 8 partes de jugo por cada parte de arena a una velocidad promedia de 2.3 a 3.5 partes de jugo por cada parte de arena por hora, según la calidad de la remolacha.

Al terminar el ciclo, el jugo yacente en el lecho de arena se extrae y se aprovecha. Entonces la arena es lavada por una corriente descendiente de agua caliente (90° C) y el agua dulce se agrega al jugo filtrado; entonces se inyecta vapor en dirección ascendente para desalojar la tarta, que luego se remueve con una corriente ascendente de agua. La capacidad filtrante, calidad del jugo filtrado y pérdida de azúcar en la torta son aproximadamente iguales a las que ocurren en filtros de placas y cuadros.

Este método tiene dos ventajas principales: que se ahorra el costo de paños y de conservación, y que se elimina el proceso usual de segunda carbonatación.

■

Extracción de Parénquima del Bagazo de Caña por Medios Mecánicos

ARTHUR G. KELLER, *Sugar Journal*, Vol. 20, No. 7, págs. 23-24; 26-27; 29-30; 32-36 (1957).

En la Universidad Estatal de Louisiana se está operando en escala experimental una nueva máquina y un proceso para la extracción de parénquima del bagazo de caña para uso en la producción de pasta de papel. La nueva máquina consta de un molino a martillos de diseño especial donde el bagazo tomado del tren de molienda es "batido y peinado", con lo que se elimina aproximadamente el 20% de la suciedad y parénquima; luego, el material se hace pasar a un segundo aparato que emplea agua para ablandar y abrir los haces de fibras. En este segundo aparato se extrae otro 5% de impurezas, de donde sala la fibra limpia y exenta de materia soluble.

El costo de operación de una planta similar en escala comercial bajo las condiciones prevelecientes en Louisiana se calcula en $0.60 por tonelada de fibra exenta de parénquima y "absolutamente seca". Tomando en cuenta todos los factores de costo, como el valor de combustible (equivalente a $2.90 por tonelada de fibra seca), embalaje, apilamiento, desapilamiento y carga, conservación, depreciación, interés o réditos, seguro, y fletes, el costo total del bagazo completamente seco y exento de parénquima entregado en la fábrica de papel asciende a $10.71 por tonelada. El costo de una planta con una capacidad de 25,000 toneladas de fibra limpia cada campaña es alrededor de $12,000. Se calcula que donde la pulpa de pino blanqueada se vende a $37.40 por tonelada, la pasta de bagazo exenta de parénquima se puede vender a $17.35, lo que le daría a la segunda una ventaja en precio de $20.05 por tonelada. Desde luego, el bagazo no se presta para tantos grados de papel como la pulpa de pino, pero dentro de sus límites de utilidad la pasta de bagazo merece la consideración de la industria papelera.

La alta proporción (35%) del costo del bagazo que su manejo y almacenamiento implican sugiere más estudio y la evolución de métodos menos costosos para realizar estas operaciones.

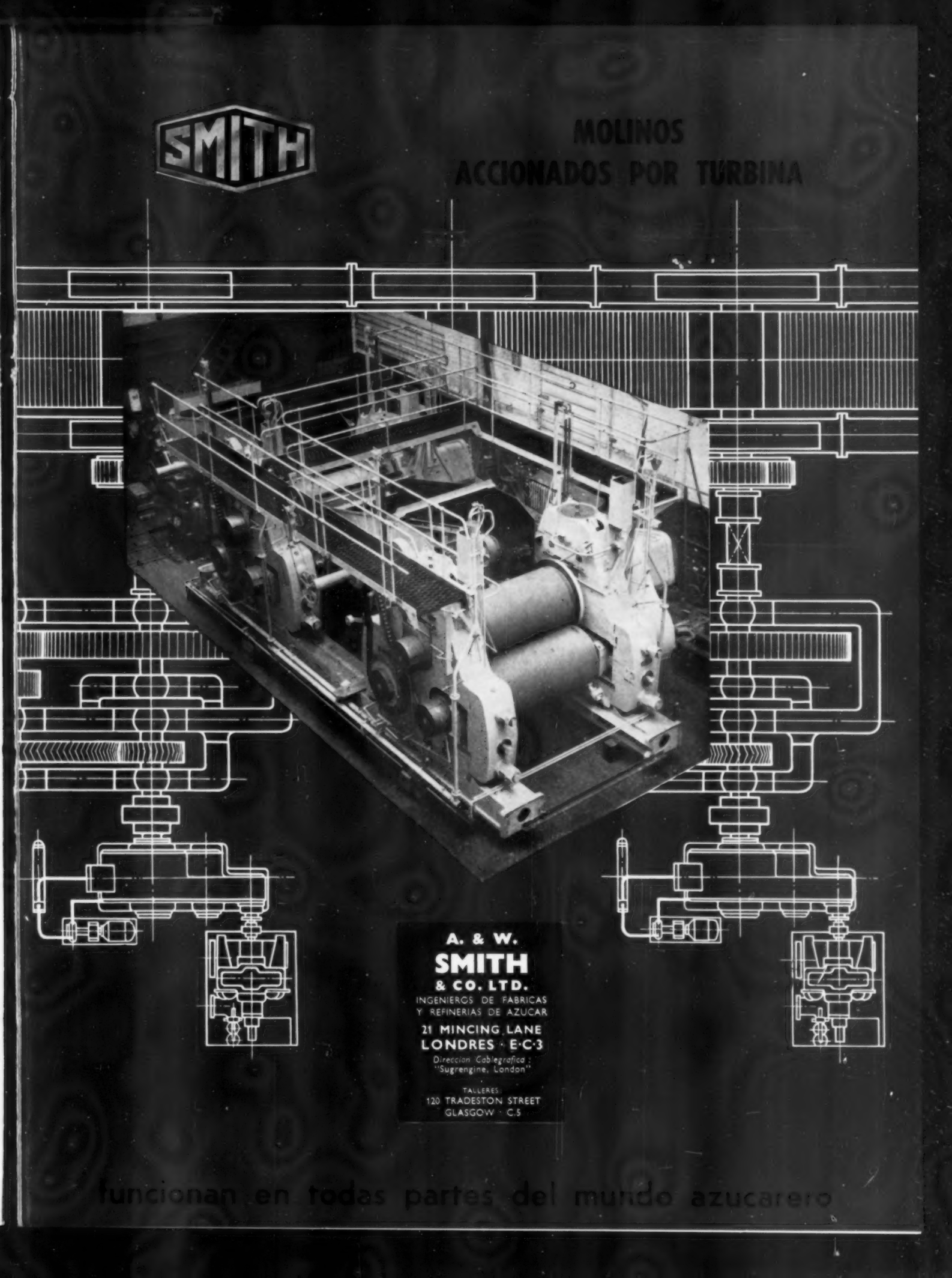
■

Pesada del Azúcar en Transportadores de Banda Continuos

I. E. LEGENDRE, P. E. CANCIENNE y J. T. LANDRY, JR., *Sugar Journal*, Vol. 20, No. 7, págs. 14-15 (1957).

La experiencia en cuatro centrales de Louisiana ha demostrado que las bandas transportadoras, en las que se pesa el azúcar automáticamente en su paso al almacén o al departamento de embarque, deben ser examinadas y reajustadas diariamente para asegurar su buen funcionamiento. Los escobillones empleados para limpiar las bandas deben mantenerse en buen estado de funcionamiento en todo momento. Aun así, la diferencia en una fábrica entre el peso del azúcar cuando fué enviado al almacén y cuando fué retirado del almacén ascendió a 293,360 libras en el curso de cuatro años, lo que representa una pérdida aparente de 0.47%. En otra fábrica, los datos correspondientes a tres años acusaron discrepancias de 0.35, 0.23 y 0.57%, respectivamente, cuando se compararon con los pesos de refinería. En una fábrica, donde los expertos enviados por los fabricantes de las básculas no pudieron obtener resultados consecuentes, se adoptó el siguiente método de comprobación:

Se dejan pasar unas 10,000 libras de azúcar por la báscula instalada en el transportador, se descarga en carretas y se pesa en una báscula de plataforma con una capacidad de 5,000 libras; los pesos de la báscula de plataforma se comparan con los pesos de la báscula en el transportador, con lo que se obtiene un factor de corrección para la báscula del transportador. Este factor varió de semana a semana, pero acusó un valor promedio de 3%. Este factor se usa una semana y para la semana siguiente se obtiene otro factor. Con este sistema, los pesos de fábrica finales se aproximan dentro de 1% de los pesos de refinería.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funcionan en todas partes del mundo azucarero

Maclean

(*Viene de la página* 49)

fundación de la estación experimental en 1895; el establecimiento de la refinería de la C & H en 1906; la inauguración del sistema de carga de la caña a máquina en 1920; y del sistema de recolección a máquina en 1937.

Durante la última guerra ocurrió un marcado descenso en la fuerza de brazos, la congelación casi general de los jornales, y una escasez en viviendas, en artefactos y en otros suministros, todo lo cual produjo un poderoso efecto al terminar la guarra que se tradujo en lo que el Sr. Maclean llamó "un interés explosivo en el unionismo hacia el año de 1945." En ese año se celebró el primer contrato con los unionistas, lo que ". . . puso fin al viejo paternalismo que había regido en la industria azucarera en el pasado." En 1956 ocurrió una huelga que duró cerca de tres meses.

La industria logró normalizar el problema de la fuerza de brazos, y tornó su atención a la mecanización en gran escala, la mejora de variadades de caña, la represión de maleza, los trabajos de riego y de abonamiento. Para el año de 1957, estas mejoras habían culminado en una producción promedia de 10.16 toneladas de azúcar de 96° por acre, con algunas centrales llegando a producir más de 14 toneladas de azúcar por acre. Durante los últimos diez años se invirtieron alrededor de $114 millones en maquinaria agrícola.

Refiriéndose a la California & Hawaiian Sugar Refining Corp., el Sr. Maclean explicó que esta era una asociación comercial agrícola encargada de la venta, en forma de azúcar crudo o refino, de toda la producción de 27 centrales y 1,300 productores independientes. La C & H produce 60,000 toneladas en su refinería de Aiea y alrededor de 750,000 toneladas en la de Crockett. El resto de los crudos producidos en Hawaii son embarcados a refinerías al Este de los Estados Unidos. El mercado para el azúcar refino incluye 11 estados en el Oeste y 11 en el Medio Oeste del país, en cuyos últimos las ventas de azúcar refino alcanzaron un promedio de 265,000 toneladas anuales durante los últimos ocho años; las ventas en el primer grupo de estados alcanzaron un promedio de 440,000 toneladas anuales durante el mismo período. Durante los siete años terminados en 1957, las ventas de azúcar crudo en la región del Golfo de México y Costa del Atlántico alcanzaron 250,000 toneladas. Las entregas a la Imperial en años recientes simplemente substituyen en aquella refinería los crudos que de otro modo serían comprados de fuentes de abasto para los refinadores al norte del Cabo Hatteras.

■

La Utilización del Bagazo

(*Viene de la página* 54)

estos cálculos. Los productos que se están haciendo ahora del bagazo en grandes cantidades todos compiten en el mercado con productos similares hechos de otras materias primas. La calidad del producto es tan importante como el costo de la materia prima. Cuando se inició el desarrollo de la tabla aislante Celotex de un subproducto agrícola fibroso, el bagazo de la caña de azúcar fué elegido entre gran número de materiales propios para el mismo fin.

La sugerencia de un detenido estudio económico no tiene el objeto de desanimar el más amplio uso de este valioso subproducto, sino el de estimular el desarrollo de usos más lucrativos para el bagazo. De más de 15 millones de toneladas de fibra de caña de azúcar que se estima se producen en el Hemisferio Occidental cada año, menos del 5 por ciento se utiliza industrialmente. De los 10 millones de toneladas de fibra producida en el Hemisferio Oriental, la cantidad utilizada industrialmente es insignificante.

La producción de tabla aislante, papel, tabla dura, productos de plástico, y furfural que se viene llevando a cabo con éxito ha sido limitada principalmente, sino exclusivamente, por razones económicas. Los mercados limitados al alcance de muchas regiones donde se produce bagazo parece que se oponen a la producción de más papel y productos de tabla hasta que la demanda mundial de estos productos aumente. Los mercados pueden ser creados, como se hizo para las bolsas de papel y papel de envolver hechos de bagazo en el Central Paramonga de la Grace Company en el Perú.

Se espera que esta información resulte en nuevos usos para el bagazo en la manufactura de productos para los cuales ya existen o se pueden encontrar mercados. Si los estudios económicos indican que una empresa en proyecto es factible, cualquier esfuerzo encaminado a la rápida expansión del uso comercial del bagazo, en beneficio de la industria azucarera, estará justificado.

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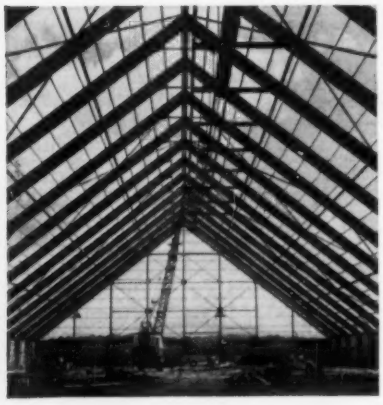

La U. S. Steel Diseña y Suministra Almacenes Económicos para Azúcar a Granel Conforme a Especificaciones del Comprador

Los diseños basados en la experiencia de la U. S. Steel y necesidades del comprador elevan la eficiencia en almacenes de azúcar a granel. La rígida construcción de la armazón (a la izquierda) elimina los soportes interiores y permite utilizar el piso plenamente. El diseño especial de los pares en tres secciones hace que se puedan armar rápidamente y facilitan los embarques por mar; hace que la armazón pueda resistir vientos ciclónicos hasta 150 millas por hora. Además, las estructuras de acero ofrecen las siguientes ventajas: protección contra incendios, mayor duración y menos gastos de conservación. Para datas sobre las economías dables por los almacenes de acero, escriba a: 30 Church Street, Nueva York 8, N. Y., E.U.A.

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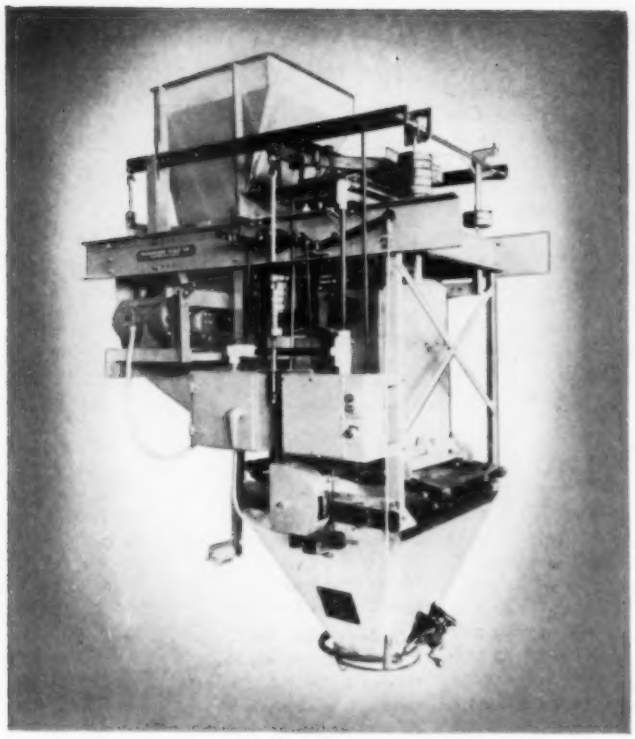

Las Básculas Richardson se ajustan a las Normas H-44 de Pesos y Medidas de EE. UU. *para su protección.*

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Optima velocidad—gran capacidad—peso exacto. Estos son sólo unos cuantos de los beneficios que puede obtener en su fábrica utilizando la BASCULA AUTOMATICA J-39 PARA AZUCAR CRUDO ALIMENTADO POR BANDA. Su bajo costo de instalación y conservación y su alta eficiencia se traducen en mayor rendimiento y economía para usted. En efecto, el equipo Richardson amortiza su costo en poco tiempo.

La Báscula J-39 funciona dentro de un margen de exactitud de ¼ a 1%, y realiza las pesadas tanto a granel como en sacos. Se obtienen hasta 400 pesadas por minuto, y más aún, en el caso de sacos de 100 y 200 libras.

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Diríjase a la Richardson para más información sobre la Báscula J-39 o básculas de mayor capacidad para mando a distancia, pesadas en libras o kilos y ajuste automático de la tara, y con los instrumentos que se necesiten.

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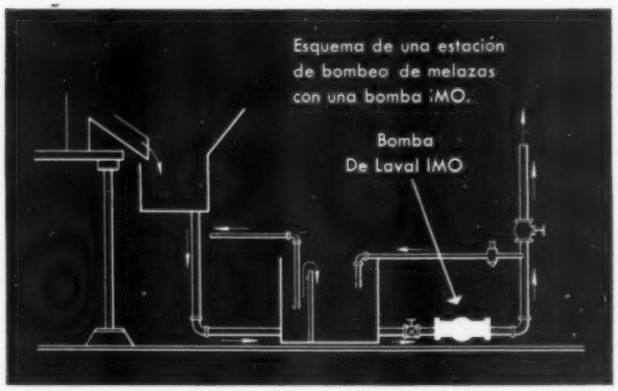

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La Dyer & Company nombrará tres jueces honorarios que se turnarán cada tres años. Cada año seleccionarán una persona que haya contribuído notablemente al comercio azucarero de los Estados Unidos. El recipiente puede ser de cualquier nacionalidad que esté directamente relacionado con una empresa azucarera norteamericana, pero se excluyen los miembros de la firma Dyer y empleados de gobierno. El premio consta de un trofeo grande de plata esterlina inscripto con el nombre del recipiente. El ganador conserva el trofeo grande durante un año, al cabo del cual se entrega al siguiente ganador; no obstante, cada ganador recibe un trofeo en miniatura inscripto con su nombre que conserva permanentemente.

Fallece Courtney Tew

El Sr. Courtney Tew, vicepresident y director de la Savannah Sugar Refining Corporation, falleció el 21 de abril a los 66 años de edad.

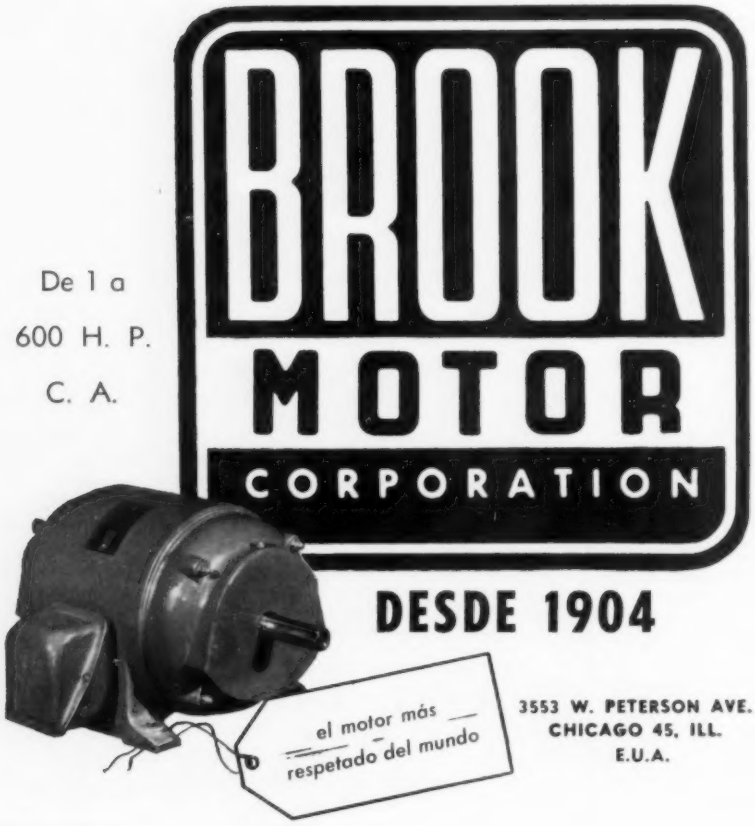
Nacido en Mounth Pleasant, Carolina del Sur, el Sr. Tew ingresó al servicio de la Savannah Sugar Refining en 1922. Poco más tarde pasó al servicio de Lamborn & Company en Savannah, pero en 1930 regresó a la Savannah Sugar Refining, en la que fue nombrado subdirector de ventas en 1932, director de ventas y propaganda en 1940, y vicepresidente en 1944. En 1955 fue electo a la Junta Directiva de la compañía.

■

San Juan

(*Viene de la página* 51)

alzado o bajado por los cables de que va suspendido y que son maniobrados por el aparejo del buque. Se puede virar 355 grados para dirigir el chorro de azúcar a cualquier parte de la bodega, y debido a la gran velocidad del chorro, los rincones más escondidos se llenan uniformemente de azúcar. El aparato ilustrado tiene una capacidad de 400 toneladas por hora y funciona a 3.500 r.p.m.



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